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COMING SOON

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Metal surfacing by hard chromium plating, especially as used in tool and die applications for improved life, giving actual results.

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ESTABLISHED 1903

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REPORT ON THE INDUSTRY

Much effort is still needed in the electroplating field to bring the quality of electroplated products up to pre-war levels. When automobile hardware, especially bumpers, begin to corrode after four to six months use while the remaining finish on the car is practically new, it does not speak well for the metal finishing field. The reason is of course that the nickel undercoat is not as heavy as formerly, due primarily to shortages and the relatively large amount of time required for heavier deposits. This however, is rapidly being corrected by means of greater availability of nickel, improved processes and basic minimum thickness specifications on this type of work in the industry.

Nevertheless, some harm has been done the electroplating industry insofar as the value of plated coatings go. This is being counteracted by the various publicity programs, the Detroit Industrial Finishing Exposition in June of this year to name one, in order that the general public will realize the value of electroplated articles and demand this finish.

With the seller's market giving way to more normal conditions, much more energy is being expended toward improving supplies, processes and equipment in order to both improve the product and reduce the cost. Filtration, de-ionization, air-agitation systems are appearing for product quality improvement; cleaners are being more and more specialized for a given basis metal application in order that they may operate faster and more efficiently; plating baths are being designed for maximum efficiency and minimum control, more and more proprietary baths are making their appearance; belt polishing techniques are making large inroads into set-up wheel methods, due essentially to reduced labor costs and increased production output in spite of relatively high initial cost for equipment conversion; electropolishing applications in production set-ups are not enjoying as much success as anticipated because of technical difficulties in large scale operations, although results are excellent on a laboratory basis; in general, electroplating materials are becoming more available and their quality considerably higher.

The executive requires more from his electroplating supervisor: he wants a man who is not only capable of handling personnel, but one who knows plating solutions, analysis, corrective measures and can exercise control over plating faults as well as production. The supervisor in turn demands more care and efficiency from his workers in view of the higher wage rate.

Business for job-shops is falling off somewhat although volumes are still well ahead of last year. Many fabricators and manufacturers are installing their own plating plants and others are utilizing their equipment more fully, thus taking work from the independent job-shop owner. The jewelry and novelty plating field has taken a sharp decline since the first of the year; however, this is seasonal work and the market is far from saturated. It is expected that business for job-shops will slip more before it gets better, improvement appearing the latter part of this year.

Shortages continue: chromic acid, soda ash, alkali, cadmium, steel being some of the more critical. It is expected that by fall of this year these shortages will be alleviated, particularly soda ash and alkali products, and zinc and lead bearing metals, including cadmium. This is due to increased imports and improved production facilities at home.

First Finishing Exposition in Eleven Years

THE Industrial Finishing Exposition, which is to be held June 23 to 27 in conjunction with the 1947 Annual Convention of the American Electroplaters' Society at Convention Hall in Detroit represents the first opportunity since 1936 for an exhibition of equipment, supplies and products in the finishing field.

The Exposition is not designed to be devoted exclusively to the electroplating field; all types of finishing products will be shown, including abrasive methods, surface treatments, cleaning and pickling, control and testing, organic finishes and methods, and one of the most novel of all, exhibitions of finished products by both metal and organic finishers.

The reason it was decided to include displays of finished products and encourage both fabricators and job-shop finishers to exhibit their work was primarily so that the full story of finishing could be explained to as many people as possible, which is in line with the policy of Exposition officials to educate the public, in order to perpetrate the industry. Accordingly, the general public is also invited to visit the Exposition. In addition, complete coverage in daily newspapers throughout the country, as well as considerable general publicity of interest to the layman is to be utilized during Exposition Week.

Because the Exposition is the first of its kind in the history of the Society, and especially because it is the first of any kind in the finishing field exclusively in eleven years, an enormous amount of interest is being expressed throughout the country.

Suppliers to the industry have planned to show every possible piece of equipment used in finishing. Developments which have not yet reached the field will be displayed together with a host of processes of interest to the large number of factory executives who will be present. These men are expected to be in search of machinery, processes, materials and services applicable to their operations.

A great deal of effort is being devoted to obtaining exhibits of an educational nature. To this end, manufacturers of products requiring finishing operations are being urged to show their wares. Similarly, contract-shop operators are expected to display a wide variety of articles in the "before and after" state, illustrating various operations in the finishing cycle.

The entire project is designed to acquaint the executive who is not too familiar with finishing equipment and techniques with the various processes. In addition, by an educational program slanted toward the general public, it is expected that the average consumer will realize the importance of the finishing field to the products in common use, thus creating a secure market for finished articles.

Polishing and Grinding

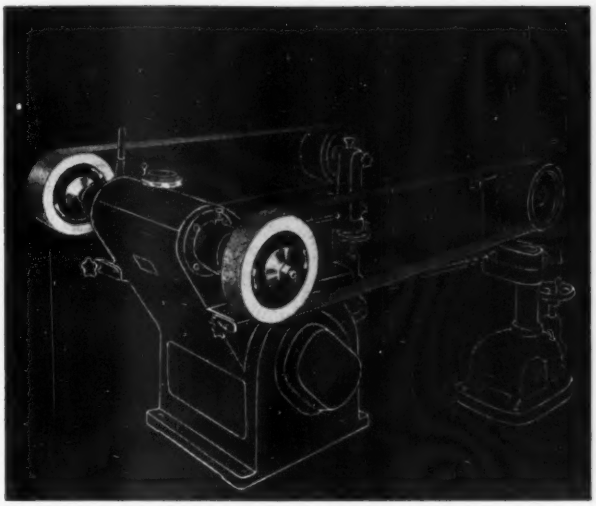


Figure 1. Typical floor-type backstand installation.

Goes Modern

By L. S. Sternal, *Methods Engineer, Minnesota Mining & Mfg. Co.*

Recent developments in polishing equipment and techniques indicate that substantial improvements in quality and cost can be obtained by the use of resilient contact wheels, idler equipment and abrasive belts. The theories involved are explained, construction and application of the various contact wheels described, abrasive belt grit sizes for given applications recommended, and future possibilities of the method examined.—Ed.

THE many shortages existing in the metal polishing and finishing field have forced manufacturers and job shops to seriously consider new materials and new methods in order to maintain production and lower costs. One of the new methods that has definitely become established as standard procedure in a rapidly growing list of industries is the use of coated abrasive belts for grinding and polishing operations.

These factory coated abrasive belts used with specially designed contact wheels on backstands have cut grinding and polishing costs all the way from 50 to 350 percent and, in many cases, have more than doubled the rate of production. They have not only successfully replaced set-up wheels, buffs and greaseless compounds; they have also provided a practical answer to some of the more pressing problems of industry today.

Rising costs, for example, make it necessary to increase production. This fact prompted a manufacturer of shears to try a backstand installation. The installation performed so well that the operator was able to turn out 400 pieces per hour, where the average production on a conventional set-up wheel was only 150 to 200 pieces per hour. In addition to the increased production, the finish secured with abrasive belts was so superior that this concern now has six backstand units in constant operation.

The backstand method of grinding and polishing consists of replacing the standard set-up wheel with a contact roll and running a belt from the contact roll to an idler pulley that maintains tension on the belt and can be cocked to properly track the belt on the contact roll (see Figure 1). The reasons for the startling results secured by this method lie in the inherent advantages of an even coating of abrasive, electrostatically deposited so as to present the sharp points to the work (see Figure 2). This factor, plus the advantages of always having a true running belt with approximately four times the circumference of a wheel, provides a uniform cool cutting surface that eliminates many of the difficulties encountered in working on set-up wheels.

In considering material costs, a set-up wheel actually costs less than abrasive belts. However, an abrasive belt will do approximately four times as much work as one set-up wheel. In addition to the faster cut of the belt, the even coating produces a better finish which

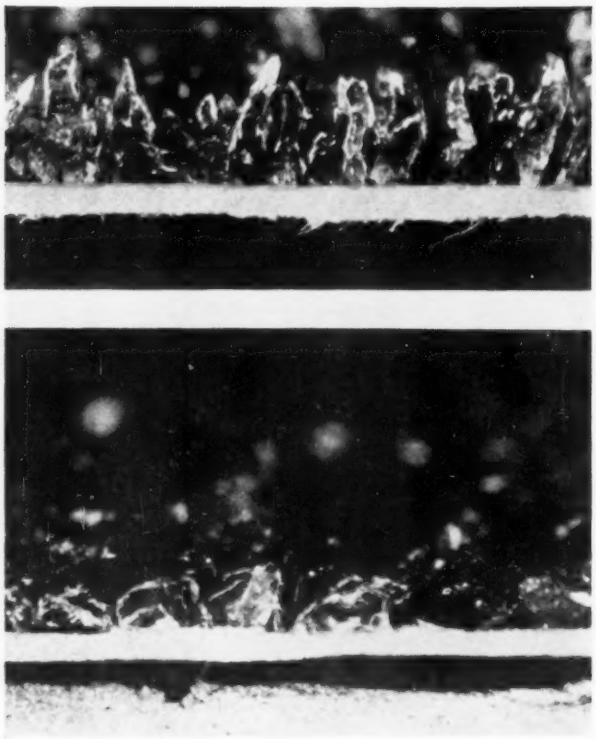


Figure 2. Abrasive belts in cross section.

Top: Electrostatic coating method deposits the mineral on the backing so that the sharp cutting edges are exposed to the work.

Bottom: Ordinary coating method allows the abrasive particles to lie flat with cutting edges not necessarily exposed.

usually allows the elimination of at least one set-up wheel grit in the sequence of operations. Instances are on record where belts have outlasted eight set-up wheels and reduced the number of polishing operations from four to two.

The final finish obtained is usually much easier to buff and much thought is being given by executives to going to very fine grit belts (320 to 600) to speed up the buffing operation and reduce the consumption of buff sections. One particular plant is using No. 400 grit belts after nickel and chrome plating on tubing to produce a very high lustre satin finish.

In comparing belts with set-up wheels for stock removal, it is possible to go 2 or 3 grades coarser and secure a comparable finish. For example, if a certain operation now calls for a No. 90 set-up wheel, a No. 50 or No. 60 belt will give the same approximate finish and yet remove stock in half the time required by the set-up wheel. By the same token, a No. 80 or No. 100 belt will give a better finish than the No. 90 set-up wheel and still do the job in less time.

In finishing operations with the finer grits, the more aggressive cut of the belt leaves deeper scratches than the set-up wheel. However, this aggressive scratch can be minimized by the use of tallow and a softer contact roll. Many instances exist where a No. 150 greased belt gives a far better surface for plating than a No. 180 set-up wheel.

One outstanding example is in the finishing of stamped steel covers for electric irons. This was formerly a two grit set-up wheel job. Today it is being done in a single operation with a No. 150 greased belt. The single operation is much quicker than either of the two previous operations and the better finish produced has simplified the copper buffing. A little charcoal used with the grease gives a brighter finish.

The secret of the success of any backstand installation lies in the selection of the proper contact roll. It is also extremely important to have a true spindle and a true running wheel. The failure of some installations has been traced to spindles worn to a taper by the frequent changing of set-up wheels. A contact wheel that is not running true will be hard to work on, will cause excessive belt wear, and will probably result in a burned wheel. A simple way to correct this condition is to have a bushing machined to fit the spindle.

The present available selection of successful contact wheels may be divided into three general classifications: segment face, compress canvas and buff wheels.

Segment face contact wheels* as shown in Figure 3 are generally used for stock removal. The cloth segment face wheel consists of sections of canvas radially inserted into a hub with an extra layer sewed and cemented to the outside half inch of the circumference. This construction gives a hard outside surface with an internal cushion and provides a "fingering" or "flexing" action which presents more than just the tip of the mineral to the work. Prior to the introduction of segment wheels it was impractical to use belts on the tougher metals or on large areas where glazing would be encountered.

Cloth segment face contact wheels are made in three densities or degrees of hardness: The first type has a cloth segment extending the full width of the face of the wheel. This type is generally used on heavy work where it is desirable to maintain a flat surface and prevent the "dumping" of edges.

The second has medium segments as from the heavier type segments. This wheel is the general all-purpose

* Developed and patented by Minnesota Mining & Mfg. Co.

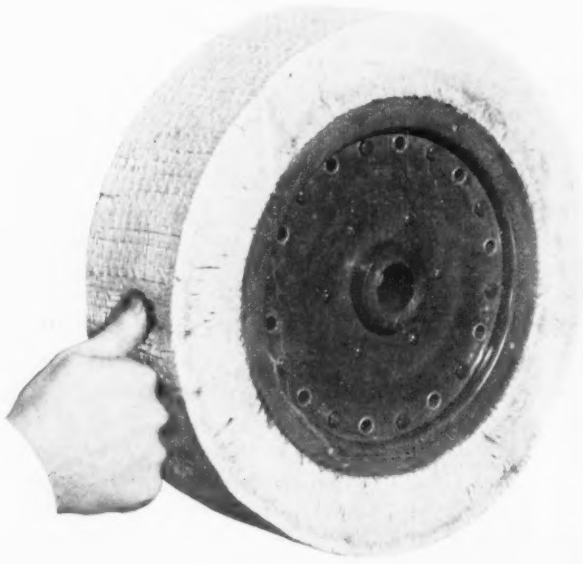


Figure 3. Segment face contact wheel.

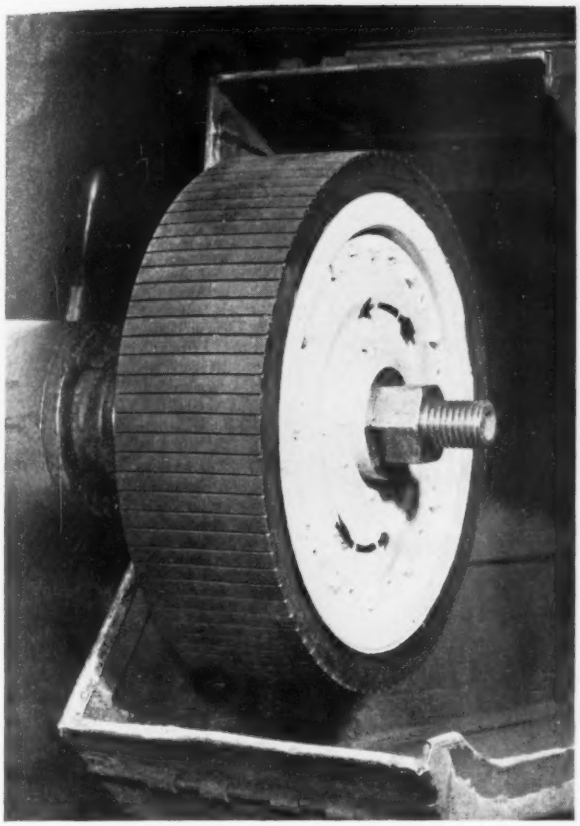


Figure 4. Rubber segmented contact wheel.

stock removal wheel and can be used for work ranging from light grinding to polishing. The "segmented" face enables the belt to lay into the hollows and valleys always prevalent in seemingly flat pieces or lightly contoured work. This wheel has been most successful on small steel forgings and small non-ferrous castings where a rapid rate of cut is desired, and has proved to be the best wheel for the many electric iron sole plates being processed today.

The third type wheel is similar to the second type but with smaller segments and is capable of grinding contours such as those encountered on small tools and parts and is used where glazing is liable to develop with other types of wheels.

Rubber segmented contact wheels are shown in Figure 4 and are made of two densities of rubber with the softer layer next to the hub and a harder slotted face. The aggressiveness of this type wheel can be controlled by varying the hardness and the width and depth of the slots cut into the face. As soon as natural rubber is again available in any quantity it is expected that rubber wheels will successfully do many of the present border line and impossible jobs.

Compressed canvas contact wheels are made with sections of canvas compressed radially into a steel hub, are available in densities ranging from very hard to super-soft. The medium soft compressed canvas wheel is the general all-around wheel and can be used for stock removal of non-ferrous metals and for harder materials in shapes that possess sufficient edges to have a dressing action on the mineral of the belt. It is an ideal wheel for die castings of all types, polishing and coloring.

For metals that are not hardened, the harder compress canvas wheels will give a faster cut and the softer wheels will give a better finish. It should also be borne in mind that a softer wheel is much easier to work on and the dyed-in-the-wool set-up wheel man will scorn anything but a soft wheel except where "hard wheel" operations are indicated.

Buff contact wheels are made of either sewed or loose buff sections to the density desired. The density of sewed buff wheels can be varied by the diameter of the cemented area. In many instances the stitching is ripped out of the outside edge to give a softer surface. The density of loose buff sections can be varied by "packing" the wheel. This type of wheel has been very successful on electric iron shells and steel stampings.

Buff wheels (Figure 5) may be crowned severely to suit the contour of the work. A number of successful installations have resulted from taking one of the set-up wheels in use on a particular job, grinding off the grain, balancing and truing the wheel, and running it as a contact wheel.

It is expected that further research into the buff contact field will provide many interesting answers to the need for better finishes. There is good reason to believe that the proper combination of abrasive belts and contact wheels will produce finishes which will eliminate a part of the buffing operations now necessary.

A recent example of this type of saving occurred in polishing drawn brass elbows. A view of the operation is shown in Figure 6. Due to various difficulties in fabrication, bad draw marks were present on the outside bend of the elbow and were being polished out

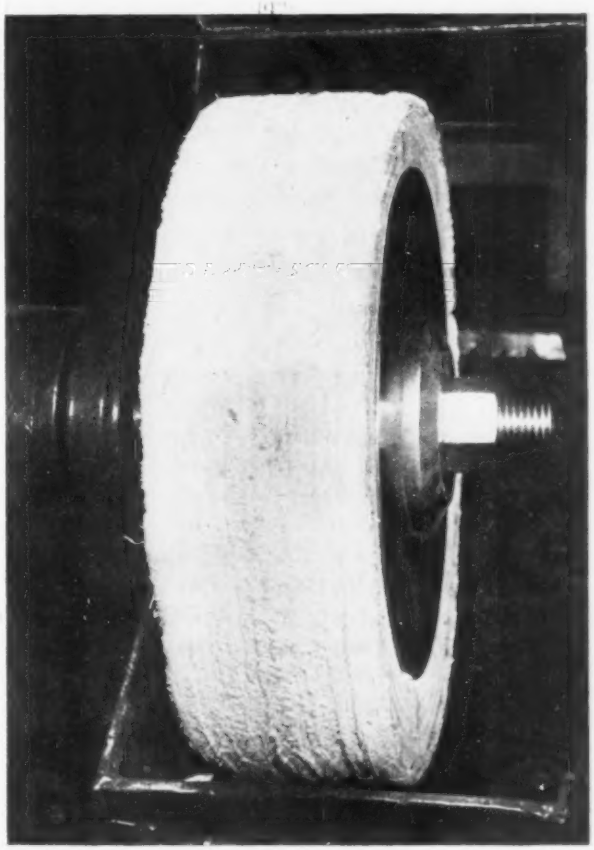


Figure 5. Buff contact wheel.

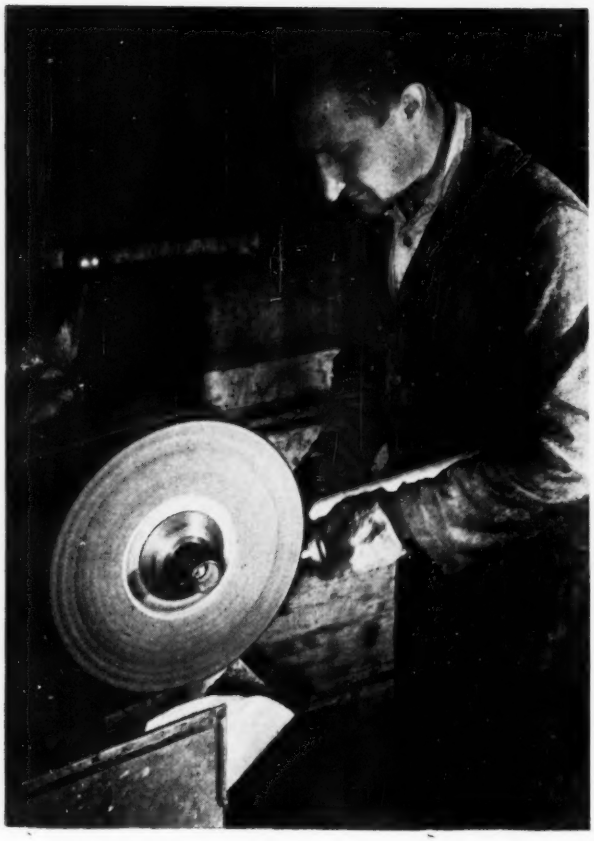


Figure 6. Polishing heavy draw marks from drawn brass elbows.

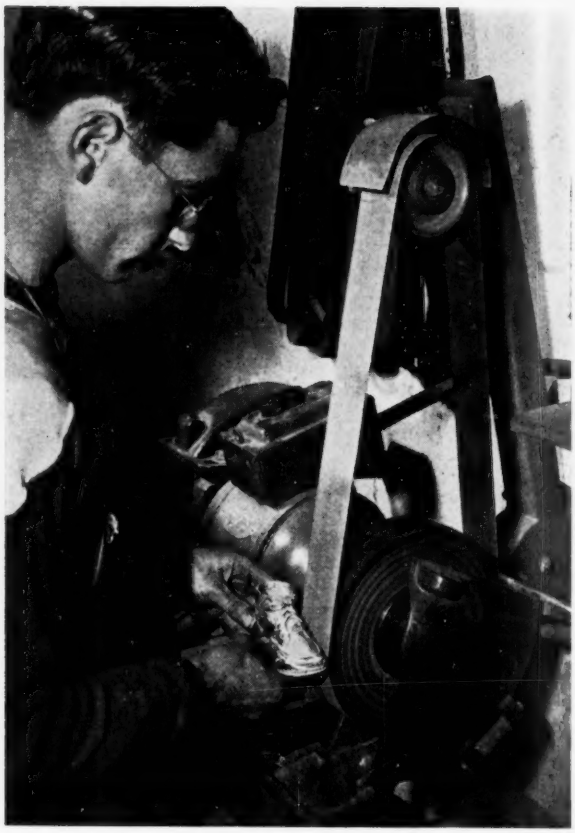


Figure 7. Polishing baby shoes with light-weight idler equipment.

with set-up wheels at the rate of 105 per hour. The first day a belt and loose buff contact roll were placed in operation, production stepped up to 225 pieces per hour and buffing was speeded up 33⅓ per cent.

In any discussion of wheels it is important to point out that many other types of wheels are being successfully used as contact wheels. Felt, rope and leather have many possibilities, but experience with them is too limited to allow any general statements.

The engineers who pioneered the development of the backstand method of grinding and polishing freely admit that they have only scratched the surface of its possibilities. The many variables involved make it extremely difficult to prescribe the procedure best suited to the individual requirements for speed of production, costs, and finishes without shop tests under actual operating conditions.

Those concerns willing to devote some effort to cooperative research have profited handsomely, and as the men who are finishing metals every day extend their efforts to learn the possibilities of grinding and polishing with coated abrasive belts, a complete new technique in the finishing of metals can be expected.

PAINTING WITH MOLTEN METAL

Another big gun in the ever present campaign against corrosion is the molten-metal spray. Frames and panels of Westinghouse radio-communication equipments have been protected in this manner, in which the steel was first shot-blasted and then "painted" with a film of molten zinc.

This method is being applied regularly by Westinghouse to the protection of shunt capacitors for pole mounting where ordinary paints have seemed inadequate because the handling during installation often scores the surface, paving the way for early corrosion. It is being applied also to transmission-line protector tubes and may be extended to other communication equipments, train-radio sets, and broadcasting equipments located in certain localities. Metal-spray protection will be useful for other apparatus that must be subjected to corrosive atmosphere such as salt air. It has been reported that the upper structure of the Normandie, for example, was protected in this manner.

Particular merit of the metal-spray idea is that the coat can be made as thick as desired whereas with galvanizing the zinc is more limited in thickness. By molten-metal spraying, surfaces up to eight mils have been applied readily to capacitor surfaces. Even if the sprayed metal is scored all the way through to the base steel, corrosion is less likely to ensue because of the more favorable relationship of zinc and steel in the electromotive series—oxidation of steel being in part a galvanic phenomenon. Sprayed metal requires no time to dry whereas conventional baking methods require both furnace equipment and time. The coating is complete and has its final durability as soon as it is applied.

Improved Barrel Plating Technique

By Herberth E. Head, *Electroplating Dept., Briggs Mfg. Co., Detroit, Mich.*

Although different organizations may have slightly varying problems, all experience the principal trouble with the common procedure of transferring work from barrels to baskets, and vice versa, as the work is moved from one bath to the next. This results in the loss and damage of parts during transfer, increased floor space requirements and excessive labor costs. The author explains how this problem was solved in the Electroplating Department of the Briggs Manufacturing Co.—Ed.

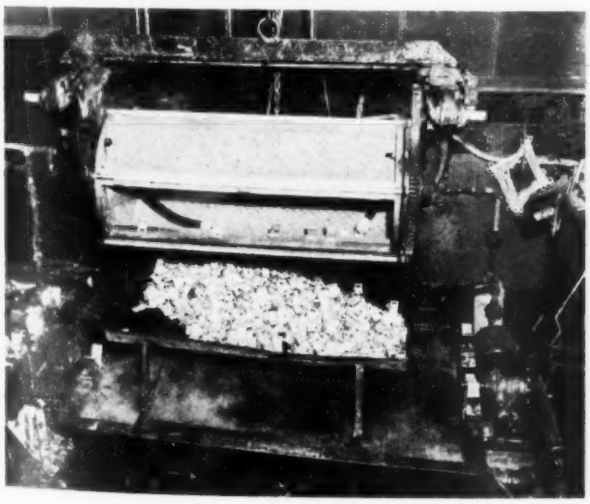


Figure 1. **Barrel shown over final hot water rinse tank, load ready to be dumped into transfer hopper.**

OBJECTIONS to continuous single barrel plating cycles could obviously be reduced to a minimum if the barrel were constructed of a satisfactory material so that the same barrel could be used in all operations. This barrel could then be transferred from one bath to the next by one man using an overhead monorail and a small power hoist. Obviously, the major problem in adopting this procedure is to obtain a barrel whose component parts are able to withstand the corrosive and solvent action of the various solutions, such as alkaline cleaners at 180° to 200° F, acid pickling solutions, and cyanide plating baths.

Electroplating Cycle

It was known that the industry in general and electrochemists in particular were somewhat unfavorable to this procedure, largely because of the difficulties encountered. These difficulties were attributed to the cylinder itself, solution contaminations caused by drag-in and the cost of drag-out. It was reasoned that if a plating cylinder could be obtained which would withstand all the solutions in the cycle, contamination and reduction of drag-out costs to within reasonable limits could be controlled in the present barrel plating cycle, which is as follows:

1. Alkali electroclean, 180° F, 12 volts, anodic.
2. Cold water rinse.
3. Pickle, 25% commercial muriatic acid.
4. Cold water rinse.

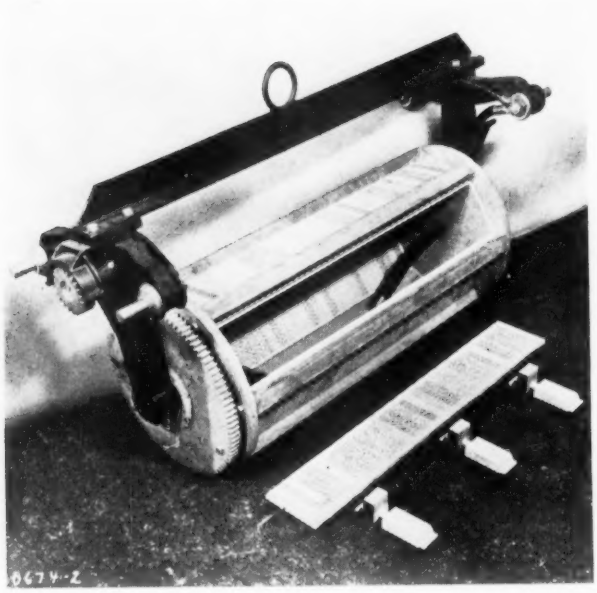


Figure 2. Melamine canvas laminate barrel before being used.

5. Barrel plate, cadmium.
6. Cold water rinse.
7. Hot water rinse, 180° F.

Because the parts are fairly heavy, enough heat from the hot water rinse is absorbed to dry themselves, hence no centrifuge or drier, is used. In the past, hard rubber barrels for step 5 above were used, the balance of the work being processed through the rest of the cycle in baskets and chutes.

Barrel Construction

Research on the problem of material selection was guided by available information and soon a set of materials for the various parts of the barrel assembly had been chosen and tested under exaggerated conditions. This work was accomplished with the valuable assistance of the technical staff of a barrel manufacturer under the direction of a qualified engineer,* where the first barrel was constructed and assembled.

* William Jackson, Udylite Corp.

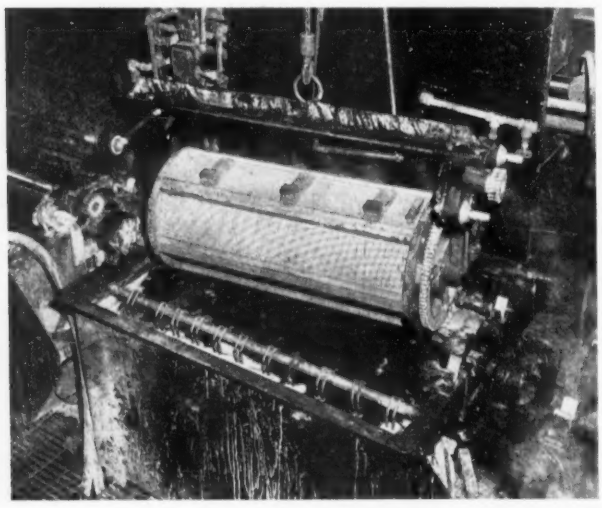


Figure 3. Malamine canvas laminate barrel after six months' constant use, 24 hours a day, 5 days per week.

When the first barrel was completed it was put into production line use where it served with complete satisfaction on a three shift basis for a period of six months in the above cycle without any adverse affects. The work was loaded prior to step 1 and remained in the same barrel throughout the succeeding 7 steps, whereupon it was dumped, Figure 1. Moreover, solution contamination was negligible because drag-out losses were small. As a result of this performance, enough barrels were ordered to fill the entire system, as it was evident that this method of operation would effect a definite savings in the cost of barrel plating. The cylinder material, melamine canvas laminate, had been thoroughly tested in both the plating and plastics laboratories and was given a two year test in the field, chiefly in plating job shops. The cylinders in use are the 14 x 36 inch size, are rigidly constructed, having rubber covered hangers and stainless steel gearing. Figure 2 is a photograph of the cylinder and superstructure assembly at the time it was built. Figure 3 is a picture of the same barrel after six months use in the cycle. Operating information is as follows:

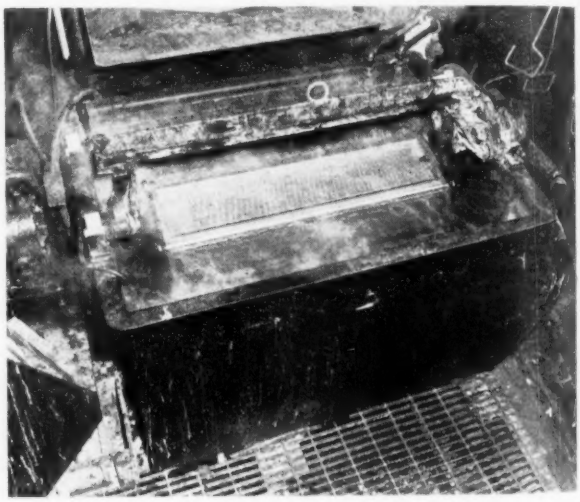


Figure 4. Barrel in hot rinse tank. Note tumbler is motor driven to insure thorough rinsing.

Metal deposited: Cadmium.
Average cylinder load: 450 lbs., 60 square feet area.
Current drawn per cylinder: 600 amperes.
Line voltage: 11 to 12 volts.
Average thickness of deposit: .0005 inch.
Plating time per load: 40 minutes.
Solution analysis: Total cyanide 16 oz./gallon.
Cadmium metal 4 "
Brightener as required (determined by Hull Cell).
All tanks, including rinses, are individually motor driven (Figure 4).

Plant Layout

The present barrel arrangement is only temporary as it was a case of fitting it into the only available space. In spite of this, production increased 50% by use of the technique described. When the cylinders are run through the complete cycle, the total savings which accrue are considerably greater than the in-

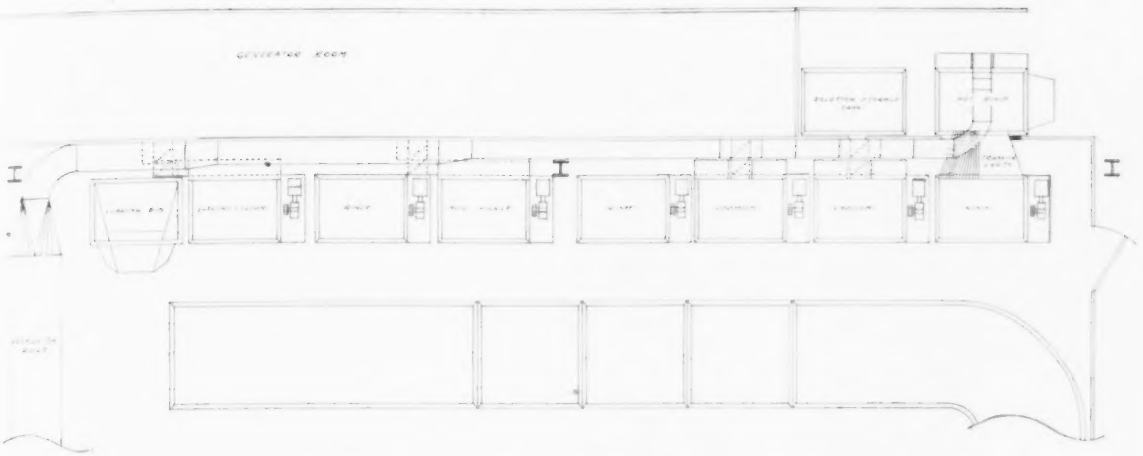


Figure 5. Present continuous straight-line barrel plating set-up.

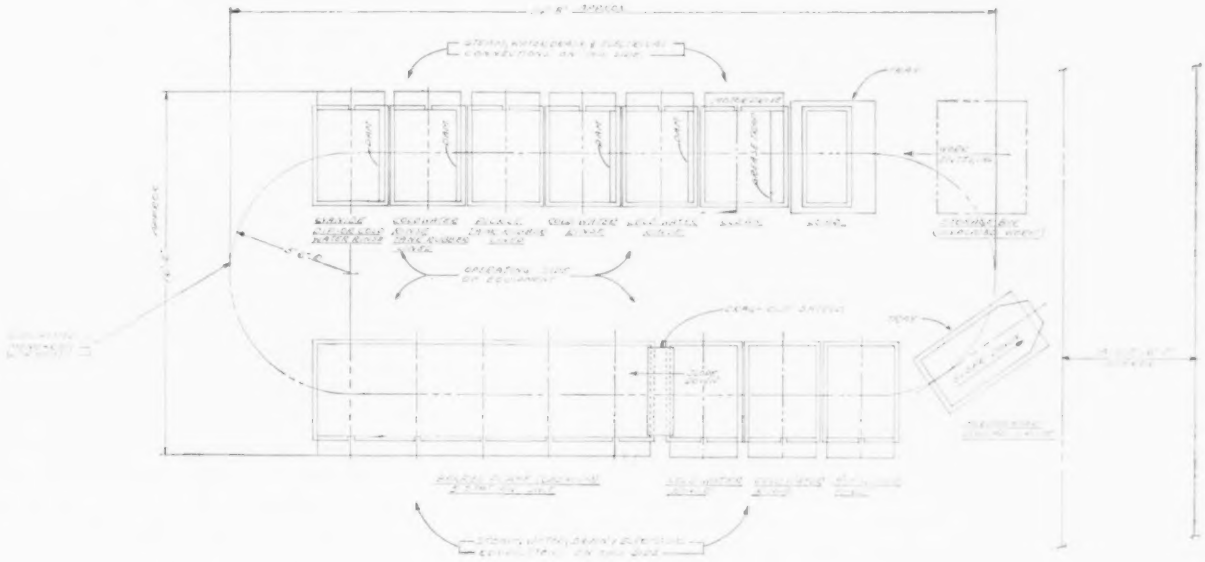


Figure 6. New continuous return-type barrel plating layout now being constructed.

creased drag-out and contamination losses which accompany this procedure.

The advantages of tumbling the work in the cleaning cycle are obtained also when motorized perforated monel-metal cylinders are used. However, because there is no surface area limitation on a monel cylinder load in the cleaning cycle, the load may be double that of the plating cylinder.

The disadvantages of the arrangement of equipment in the present barrel plating department are apparent (Figure 5). It is much too small and the work flows in a long line. It is planned, therefore, to build a new and larger department laid out according to Figure 6 in which eleven melamine cylinders will be used. This is an example of the return type arrangement; it has the advantage that the flow of work is from right to left and that the cylinders at the end of the cycle are back at the loading station. Because all the tanks will be motorized, the work will be tumbled in all stations except the loading and unloading. The aisle at the right will be used to bring work to and take work from, the barrel plating department. Although this procedure is not entirely new to the metal finishing industry, it is felt that because there is no interrupted work flow, increased efficiency will result.

In conclusion, this procedure is not necessarily advocated for every barrel plating shop. However, for large volume relatively small variety work the equipment and technique has proved to be more efficient than the former procedure.

Electroplating Zinc Base Die Castings

By C. F. Nixon, *Dir. Process Eng'g., Fisher Body-Ternstedt Div., Gen. Motors Corp.*

Polishing, buffing, cleaning, plating and stripping of zinc base die castings are discussed as well as casting techniques for improved surface conditions. The author confines himself to an explanation of methods presently used to finish hardware and includes comments on experimental work. This informative paper is a constructive examination of electroplating production processes of zinc base die castings. —Ed.

IT IS interesting to note that from the beginning of what is now understood to be the zinc base die casting industry in about 1917, considerably more than half of all die castings made have gone to the automotive industry. In 1925, Marc Stern estimated that 75% of all die castings were used in automobiles. In August, 1946, the United States Bureau of Mines indicated that 17,191 tons of high purity zinc was used for zinc base die casting alloys. Of this tonnage, about ¾, it is estimated, finds automotive application. Of the die castings used on automobiles, about ¾ are chromium plated—and of the die castings used on automobiles which are chromium plated, about ¾ are used on the outside of the car.

Having in mind that very few plated zinc base die castings are used where they are subjected to out-of-door exposure except on automobiles, it may be said that about a third of all zinc castings are used in this manner.

In the late twenties, when the introduction of chromium plate so greatly improved the appearance of plated parts, particularly those used on the outside of the car, the use of plated parts for trim increased. At the same time, attention was focused on failures due to rusting or to corrosion. The importance of plate thickness with respect to durability was soon recognized. In 1926 the General Motors Class A specification for nickel plated steel parts was simply: "Nickel plated parts shall withstand 24 hours in a salt spray test without appearance of rust on significant surfaces." In 1930 the requirement that the minimum plate thickness shall be .001" minimum was added. In 1932 this same thickness requirement was extended to cover die castings.

Opportunities for the application of die casting increased with the trend toward more exterior trim. However, and it was a matter of importance, in the case of die castings the thickness of the plated deposit could not be readily increased. The high sulfate, high pH, double salt nickel bath then used for direct nickeling of die castings practically could not be used to build deposits heavier than about .0003". In addition, great difficulty was experienced in completely covering parts which were at all complicated in shape. These things hindered the desired development of the use of die castings, or as it sometimes happened, perplexed the plater with problems he did not have the means to solve. It was a logical and imperative development that attention should turn to copper as an undercoat, even though it was generally reported to be unsuitable, because of absorption by the zinc alloy.

References to the use of copper plate as a first deposit on zinc base die castings may be found in the literature as early as 1921. However, copper plate was not used in production, to the writer's knowledge, for this purpose before 1930.

The introduction of copper plate as a first deposit on die castings made it possible, first, to successfully plate die castings of complicated shape and, second, to develop total plate thicknesses sufficient to assure reasonably good performance out-of-doors. Failures due to absorption are found not to be serious at normal temperatures if a minimum of .0002" of copper is maintained for outside exposure. Even .0001" minimum for interior exposure seems quite satisfactory, based on experience over a number of years.

Because of the facility with which parts may be copper plated, the use of the copper strike has come into general use for all parts including interior die cast hardware, even though deposits of nickel heavier than .0002" are not required for satisfactory corrosion resistance on such parts.

At the present time, Class A, which calls for a minimum total plate thickness of .001"—the same, it may be noted, as it was in 1932—is most generally specified and should, if properly applied, give satisfactory performance out-of-doors for a year in industrial atmospheres.

The trend at the present time is toward heavier deposits, AA (.0015" total) and AAA (.002" total), for still better corrosion resistance. The experience with respect to cars which have been used continuously during the war period has made everyone in the industry more conscious of plating quality with respect to performance out-of-doors. While improved corrosion resistance is the goal, it is continuously necessary to keep an eye on the cost of producing the desired finish.

Polishing and Buffing

Die castings as cast are die trimmed to remove from them the sprue and runner. At the same time, any flash which has appeared at the die parting line is also trimmed off. Following this operation, the part is polished to remove surface irregularities remaining from the trim operation and also it may be polished to remove defects in the surface of the casting. Following the polishing operation, the parts are buffed to a high lustre and are then ready for plating.

In order to minimize the cost of this preparation for plating and also in the interests of the quality of the finished piece, the die caster strives to produce a casting free from surface imperfections. Aside from the polishing necessary to repair the surface damage done by trimming, a good die casting requires no polishing whatever. A buffing operation only should be required to prepare it for plating.

It may be desirable to enlarge somewhat on this statement. General Motors has sponsored what is to date a series of two Joint Industry Conferences on Zinc Base Die Casting Quality which were attended by corporation representatives and representatives of the leading zinc producer and of many of the leading companies engaged in the production of die castings. These conferences were inspired, in part, by complaints that the difficulty of producing acceptable plated parts at a price was greatly increased by surface defects which required polishing to remove or minimize. The following interesting conclusions may be drawn from these conferences: First, that die casters recognize the need for smooth castings free of surface defects, and second, that while the gating of a die must be still considered an art, sufficient knowledge of the principles involved in gating as well as knowledge regarding die casting machine operation and metal control is available, so that, for most part, the finisher may with fairness demand and hope to get castings with smooth, sound surfaces.

The quality of the surface of the casting which so greatly influences the labor required to prepare for plating, and also the quality of the finished piece, is affected by the quality of the metal used, by its temperature, by the plunger pressure, by the speed with which the cavity is filled, by the design of the sprue and runners—gating, location of cavities in the die, by surface of the die cavity, and by the temperature of the die. Without going into detail as to the specific effect of the above factors, suffice it to say that the casting defects most troublesome to platers are shills, swirls, cold laps, splashes, gate holes and soldering.

As these defects occur on significant surfaces, it is usually necessary to remove them by polishing. As is well known, die castings, by virtue of the process by which they are made, have a thin, dense outer skin below which the metal is coarser grained and more porous. When polishing, carried out to remove surface defects, cuts through this skin, defects thus revealed may well be as troublesome as those for which polishing is used as a corrective measure.

The irregularities at the parting line surface of a die cast door handle are typical of all die castings. Polishing is required to smooth this surface and to remove casting defects which it may be necessary to accept on other significant surfaces.

Polishing is done by means of a sheepskin wheel coated with glue and emery, usually 180 or 220 grit, or by means of an emery belt which may be driven by either a hard wheel or by a cloth buff wheel if a more flexible polishing surface is desired. Grease is applied to the wheel to prevent loading or glazing to reduce friction, to increase the life of the abrading surface, and to improve the quality of the ground surface.

Buffing is done on cloth wheels 10" to 14" in diameter sewed as the nature of the particular job demands—which is usually determined by experiment or experience with previous similar jobs. A tripoli compound is used. Wherever possible, automatic equipment is used in preference to hand polishing or buffing.

Cleaning

The cleaning of parts before plating is undoubtedly the most difficult thing the plater has to do. Dr. O. P. Watts, now retired, of the University of Wisconsin, used to tell his students in electroplating that plating was 90% cleaning. He did not have zinc base die castings in mind but not many platers will dispute his figure even now, unless it be to make it higher.

Buffed die castings, particularly those which have been automatically buffed, are sometimes very dirty. Buffing compound has a way of filling cavities and recesses which is troublesome to the plater. All such soil must be removed with minimum chemical action on the die casting, if subsequent plating is to be successful. Anderson and Reinhard emphasized the fact that copper deposit is prone to blistering when applied to die castings that have been exposed over-long in an alkaline cleaning solution or exposed in a cleaner that is too strong.

In order to remove this soil with no chemical effect, the first step in the cleaning process is trichlorethylene degreasing. A so-called three phase degreaser, which combines vapor degreasing with hot trichlorethylene spraying, serves to remove all or most all the foreign material from the part. Wherever possible, parts are placed on plating racks before degreasing to minimize handling.

The degreaser may be relied upon to remove the polishing compound binder completely (unless it be in some very tightly packed crevice) but occasionally some of the solids of the buffing compound will remain on the work. This must be removed by hand brushing; the brief alkaline cleaning which follows will not take it off.

The balance of the cleaning and plating cycle may be carried out using still tanks, or, given sufficient volume of production, automatic plating equipment may be used. In either case the sequence of operations is essentially the same, although in some cases it may be necessary to modify conditions in various tanks to accommodate the process to the time cycle of an existing plating machine.

The alkaline cleaning is done in a solution containing 2 or 3 ounces of a cleaner made up of 55% soda

ash, 25% trisodium phosphate and 20% of sodium hydroxide. This is one of the G.M. specification cleaners. The temperature is approximately 200° F. The work is anode and the voltage from anode to cathode is about 6 volts. This cleaner would serve its purpose, when fresh, used as a direct cleaner. Reverse cleaning is preferred, however, because the effects of contamination with chromium salts and with zinc and copper salts are less. It is not felt that the formulation of the cleaner given is critical. Undoubtedly, it could be varied within quite wide limits and still do a satisfactory job. Because of possible contamination, as referred to above, this cleaner is renewed frequently.

Strictly speaking, perhaps the operation just described is not as much a cleaning operation as it is a chemical treatment operation. The work, as it enters this cleaner, has been degreased and usually looks to be quite clean, however, work taken directly from the degreaser to the copper strike tank will fail due to the poor adhesion of the copper deposit.

Following this alkaline cleaning, the work is rinsed in cold water, and immersed for 20 or 30 seconds in a 1½% sulphuric acid dip. Following the acid dip, the work is again rinsed and is ready for the copper cyanide deposit.

At various times, other acids than sulphuric have been used successfully. There are some advantages to using a weak hydrofluoric acid dip but they are not sufficient in the writer's opinion to offset the hazards involved in the handling of concentrated hydrofluoric acid incident to the making up of the dip.

There is an important relationship between the strength of the acid dip and the strength of the alkaline cleaning. If it is necessary to use a stronger cleaner or to clean for a longer period of time, then it seems to be necessary to increase the strength and the time of acid dipping. However, in general, it seems safe to say that both the cleaner and the acid should be as weak and as short of a duration as possible. For a particular set of circumstances, it is necessary to establish concentrations and times by experiment. When the sequence of cleaning and acid dipping given above is used, the die casting is but slightly more gray in appearance as it comes from the acid dip than it was when it went into the cleaner.

The copper strike solution contains 2½ to 3 ounces of copper cyanide and ¾ of an ounce to one ounce of free cyanide. In addition, one ounce of sodium hydroxide and from 4 to 6 ounces of Rochelle salts per gallon are added to maintain anode corrosion. The solution temperature is maintained at 110 to 115° F. Some steel anodes are used along with the copper anodes in sufficient quantity to prevent a build-up of copper concentration. It is important that the copper content be kept within the limits prescribed in order to secure a sufficiently bright or smooth deposit. Under these operating conditions, the sodium carbonate content will not build up to excessive concentrations. The sodium carbonate content is kept less than 15 ounces per gallon. The current density usually employed is between 20 and 30 amperes per square foot. The time of plating in the cyanide bath may run from 5 minutes to 10 minutes. It is not considered desirable to attempt to build much more than .0002" of copper plate thickness in this bath if bright deposits are to be used over it, without buffing.

Following the completion of the copper strike operation, the desired thickness of deposit in copper or in nickel or in both may be built as for any other base metal. In order to reduce cost, there is an increasing tendency to use bright copper deposits and bright nickel deposits followed by the chromium plate without buffing operations on either the copper or the nickel. This obviously is not essential to the production of a satisfactorily plated die casting but such a procedure does completely eliminate the hazard of cut-throughs as a result of buffing, and, of course, does hold down cost.

When parts are carried from one plating operation to the next without an intermediate buffing operation, the parts are not ordinarily unracked until after chrome plating. Under these conditions, even though the greatest care be exercised, it is not always possible to prevent contamination of cleaning solutions with chromium, as referred to above.

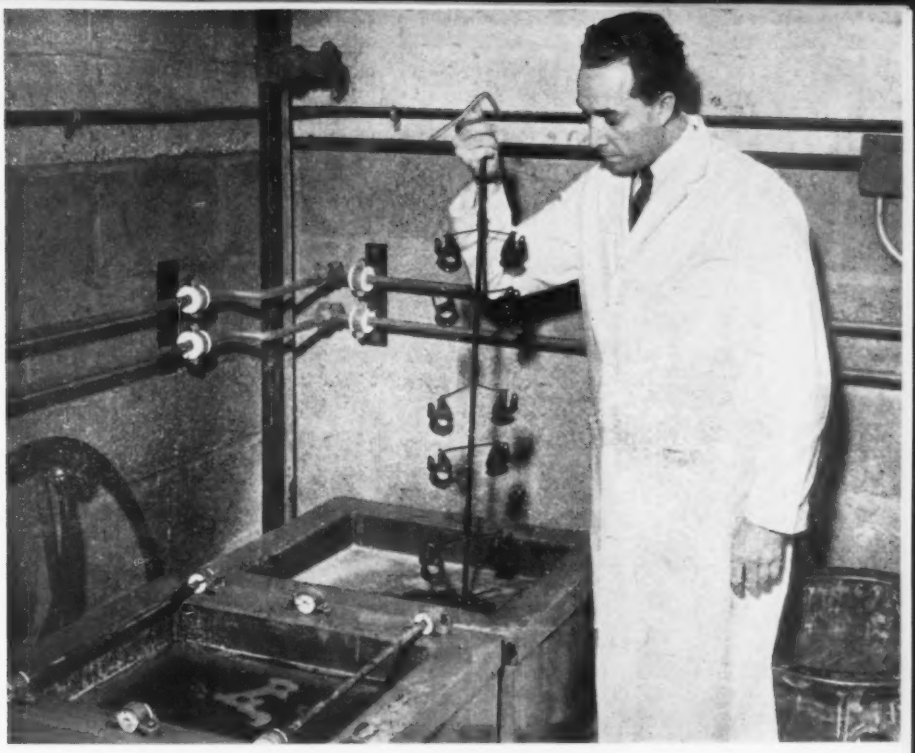
It is desirable, before racks are used again, to strip them anodically in a sodium carbonate solution to remove as much of the residual chromic acid and chromium as possible.

Stripping

There is no altogether satisfactory method known for the stripping of heavy deposits made up of copper and nickel, from die castings. The best method for stripping such parts known to the writer is the sulphuric acid strip. As a result of considerable experimental work, a concentration of 50% to 55% was settled upon as being best. The stripping action was reasonably rapid on both the nickel and the copper, while the attack on the die casting was not ordinarily excessive. The temperature recommended is 150° F., voltage 9 volts. If the concentration of acid is increased, the rate of attack on the copper becomes quite slow. Under these conditions, when base metal is reached in certain portions of the piece, attack on the die casting may be severe before the balance of the copper has been removed.

Additions of glycerine have been tried but are not recommended. There is no appreciable improvement in the quality of the stripping but there is an increase from the hazard point of view, in view of the fact that glycerine causes foaming. The foam bubbles contain both hydrogen and oxygen which may be exploded by a spark. Such an explosion may splash acid. Many other additional agents have been tried, such as mannitol, ethylene glycol, formic acid without finding one which contributes significantly to the performance of straight sulphuric acid.

There are other means available for removal of copper only which are satisfactory but are not applicable when the copper has been nickel plated. Immersion in a polysulphide bath or anodic treatment in a sodium cyanide-sodium sulphide bath will serve this purpose among others.



Copper plated steel parts being blackened in alkaline chlorite solution.

Finishing Copper by Oxidation with Sodium Chlorite

By Walter R. Meyer[1] and G. P. Vincent[2]

Oxide finishing of copper and its alloys by use of sodium chlorite and alkali is described by two authorities in the field. An immersion process, it not only prevents further oxidation of the surface, but acts as an excellent base for organic coatings due to the toothing of the surface caused by the oxidizing reactions. Pre-treatment preparation of the metal is given and control conditions of the bath explained.—Ed.

LIKE many other wartime developments, the copper finishing process which employs oxidation with sodium chlorite, a chemical made commercially available shortly before the war, offers many advantages to peacetime industry. The procedure* was used for the armed forces on a variety of articles requiring a dull finish of unusual durability. For example, the process was widely used for blackening brass coaxial tubes used in radar equipment because of its resistance to corrosion and because of the small amount of dimensional change involved in the treatment. Other products satisfactorily treated by the process were brass shells, copper and brass grommets, aerial wire, measuring instruments, optical goods, fittings, screws, radio parts, and personal hardware. Particularly suitable where black finishes are desired, the process may also be used to produce other colors.

An illustration of the advantages of the process is furnished by the experience of a Canadian optical manufacturer. During the war, the manufacturer was required to blacken copper and brass components of optical instruments. Neither paint nor lacquer would fill the bill because of build-up on machined surfaces. A dead black finish was essential for minimum light reflection in order to prevent interference with the optical train of the instrument. All of the standard methods were tried, but only one gave a good black finish, which had to be oiled, however, to withstand weathering— a condition to be avoided if possible. When tested for weathering at normal conditions of exposure, all the finishes tried broke down in less than twelve hours.

When the optical manufacturer used the oxidation process, it was immediately successful, producing a durable black finish in between four and seven minutes.

The Blackening Process

Blackening with the salts—which consist principally of sodium chlorite and alkali—is an oxidation reaction. In the alkaline solution formed when the salts

[1] Enthone, Inc., New Haven, Conn.
[2] The Mathieson Alkali Works, Inc., New York, N. Y.
* Patented as the "Ebonal 'C' " process under U. S. Patent No. 2,364,993. Owned by Enthone, Inc., New Haven, Conn.

are dissolved in water, sodium chlorite oxidizes copper to form a solid, jet black, wear-resistant coat of copper oxide which is also heat stable and chemically inactive. Because the black coat formed in this manner is an integral part of the copper base, and not merely a superimposed layer such as a paint or a lacquer, it has excellent adhesion. And as the cupric oxide already contains oxygen, it does not oxidize further, that is, react with air. The finish is also resistant to moisture and chemicals and does not discolor when handled. When tested for corrosion resistance, the bare finish withstood a 25-hour salt spray, and a protective coat of wax or oil applied to the finish increased the salt spray resistance to 200 hours.

Moreover, the finish does not decompose at temperatures below 500° F. nor flake when subjected to extreme deformation. It has the further advantage of forming in an extremely thin coat of from 0.00005" to 0.0001" in thickness. The dimensional changes in blackening are of the order of only 0.00005".

The process can be used for blackening of all copper alloys containing 60% or more of copper. Alloys containing 90% or more of copper can be blackened without any pretreatment other than cleaning and acid dipping. However, with alloys containing 60% to 90% copper, it is recommended that an activating pretreatment be used to make the surface more receptive to blackening. Salts containing the oxidizing agent and alkali in a different ratio can be obtained for activating these alloys. Pure copper, whether cast, rolled or electroplated, is quickly given a deep black finish. Copper-plated work can also be blackened by the process.

Steps in the Process

Cleaning of metal surface is the first step. An alkaline cleaner should be used and cleaning should be done as thoroughly as for electroplating, that is, to no "waterbreak." Cleaning is essential for successful blackening, for no matter how thin oxidized or greasy layers may be they will retard the chemical action of the bath ingredients. Any tarnish that is formed in cleaning should be subsequently removed by dipping the work in a 4-ounce per gallon solution of sodium cyanide.

Bronze bearing housings blackened for corrosion protection and reduced visibility.

The next operation preliminary to blackening is etching or bright dipping in order to remove worked metal from the surface and also to provide a uniform, metallurgically active surface which is readily blackened. When bright dipping is done the following formula may be used:

Sulphuric acid	2 gallons
Nitric acid	1 gallon
Water	1 quart
Hydrochloric acid	1 fluid ounce

This dip should be used in earthenware crocks. Some familiarity with it is necessary in order to get successful results, and caution should be exercised since it gives off nitric oxide fumes, which are corrosive and poisonous.

If a bright dip cannot be used, a dip in a solution containing 50% of nitric acid by volume will serve, but this dip is not as effective as the one mentioned above.

A frequently used etching solution which, however, is much more difficult to rinse off than the bright dipping solution is the following:

Chromic acid or Sodium dichromate, $Na_2Cr_2O_7 \cdot 2H_2O$	8 ounces 12 ounces
Sulfuric acid, concentrated,	4 ounces by weight or 2½ fluid ounces
Water	1 gallon

This solution should be used at room temperature and kept in an earthenware crock. Customary etching time is about two minutes, though longer etching does no harm other than remove metal. Metal is properly etched when its surface is uniformly crystalline. After etching, the work should be rinsed in two separate running rinses to prevent contamination of the oxidizing solution with chromic acid.

Electroplated copper should not be etched or bright dipped, but simply cleaned and cyanide dipped to remove any surface stains. Sand blasting and wire brushing with a greaseless composition are other methods of cleaning the metal.

When the work has been thoroughly cleaned it is immersed in the blackening solution. The tank containing the solution should be made of low carbon steel or stainless steel, and should be welded, not soldered, because the solution will quickly dissolve solder. Zinc, tin, and lead are also readily oxidized by the solution. Because of its high alkalinity, it will gradually attack enameled ware and ceramic vessels, which should not therefore be used as containers. Another reason for not using enamel or ceramic materials is that their components may contaminate the solution.

The concentration required for general blackening is 1½ pounds of the oxidizing salts for each gallon of water. When a fresh solution is made, the tank should be filled with three-fourths of the total volume of water required and the salts added and stirred until they are completely dissolved. Then more water should be added until the proper dilution is reached. The boiling point of the solution prepared in this

manner is 219° F., and the specific gravity 1.1416 (18.5° Baumé) determined at 70° F.

Precautions to Be Observed

While the salts are being dissolved, some spray, caused by the alkali present, will form. However, it will disappear after the salts have completely dissolved, and there should be no unpleasant fumes evolved during the blackening process.

Since the blackening salts contain caustic soda, care should be taken to prevent them from coming in contact with the skin. The salts should not be added to a boiling solution because of the danger of eruption. When additions are to be made, the solution should be cooled to 200° F. or lower and the salts sprinkled in, rather than added in a large quantity at one time.

Furthermore, since the sodium chlorite present in the blackening salts is a strong oxidizing agent, they should not be allowed to come in contact with organic matter such as cloth, oil, wood, rubber, paper, or sawdust or with strong reducing agents such as sulphur. Otherwise, ignition may occur. A sensible precaution is the use of clean shovels—which should be iron or steel—and clean containers. The salts are stable and will not burn by themselves.

If the salts or their solutions are spilled on clothing or other organic matter, thorough rinsing should be carried out.

The operating temperature of the solution is not particularly critical. High copper alloys blacken at lower temperatures and more quickly than low copper alloys. For general blackening the solution is usually kept at between 210° F. and its boiling point. In order to prevent the solution from becoming too concentrated, water should be added from time to time to replace the water lost by evaporation.

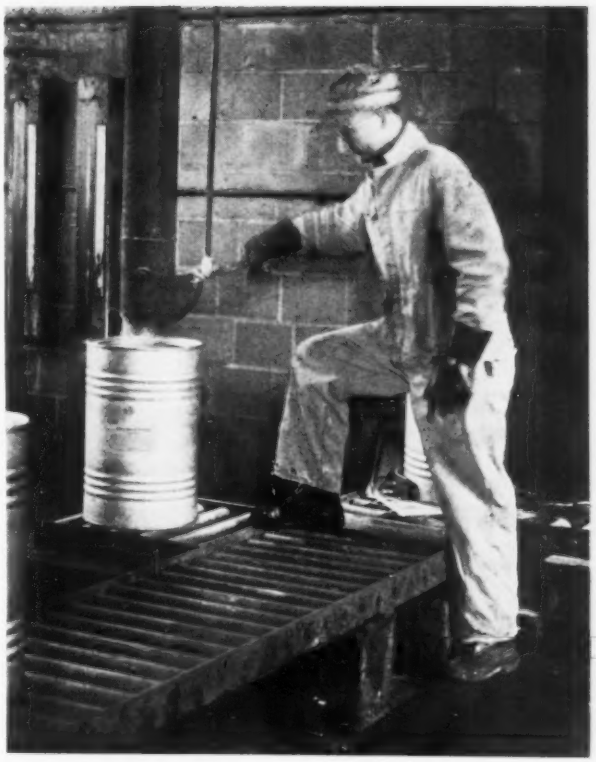
The concentration may be determined by checking either the boiling point or specific gravity (density). When the concentration is correct, the solution boils between 218° and 220° F. and its density is between 18.5° and 19° Baumé at 70° F.

The immersion time required depends upon the copper content of the work. Pure copper and high copper alloys blacken in from 3 to 10 minutes. Low copper alloys may require 15 minutes, but they can be blackened in less time if given an activating treatment, as previously mentioned. Properly blackened parts may be recognized by the appearance of a uniform "fuzz" or nap, which is jet black.

Small parts can be blackened in steel baskets or cylinders and large objects on iron or copper racks, hooks, or wires. If baskets are used, the work should be shaken occasionally in order to expose contact surfaces to the solution. This will prevent the appearance of bare spots.

After blackening, the parts should be rinsed thoroughly in running cold water and then, if they are to be dried, in hot water.

The finish usually resulting from the blackening treatment is a dull velvet-appearing nap. This nap can be laid down by several means. To obtain a dull surface on large objects, brushing with either a Tampico or horse-hair wheel using a small amount of



Sodium chlorite being loaded into drums for shipment.

Montan wax is very satisfactory. If a deeper semi-bright surface is desired, the work may be wiped with an oiled cloth after the brushing.

A dull finish may be imparted to small objects by dipping them in a wax emulsion and then tumbling dry in sawdust. Or they may be tumbled in waxed or oiled sawdust or in waxed or oiled cut leather and cork.

For a high-gloss finish the nap should be polished with a loose cloth buff and either a rouge or lime compound. Pure copper and copper-plated objects give the most satisfactory high-gloss finishes. The finish is enhanced if, before blackening, the work is buffed to a high luster with a loose cotton buff and then cleaned, preferably by a process involving little attack upon the metal.

The velvet finish is an excellent base for organic coatings, such as paints, lacquers, and enamels, since it offers a firm tooth for anchoring the coating. In addition, because of its stability, it prevents reaction between the base metals and any free fatty acid in the organic coating.

Copper and copper alloys need not be oxidized to a jet black to prepare them for coating. Treatments are available for producing various shades so that the color of the finish will blend with the color of the organic coating applied.

If the finish is to be used as a base for organic coatings, it should be given no treatment other than thorough rinsing and drying. Objects can be given a beautiful dull finish by spraying with a matte clear lacquer, which contains a flattening agent. For work that is to be subjected to severe outdoor weathering it is recommended that the protective effect of the

(*Concluded on page* 71)

Electropolishing With Fluosulfonic Acid

Conclusion

By C. B. F. Young, Ph. D. and Kenneth R. Hesse

Discussion of Results

THE fluosulfonic acid and phosphoric acid baths showed very good polishing characteristics for 18-10 stainless steel and for low and high carbon steels. The concentration limits for the bright polishing of these metals range from 5 to 30 per cent fluosulfonic acid, the remainder being phosphoric acid (sp.gr. 1.71). The optimum concentration for polishing stainless and plain carbon steels is from five to ten per cent fluosulfonic acid, using a current density of from 140 to approximately 1000 amps/sq.ft. (46 to 328 amps/sq.dm.) and a time interval of two to five minutes depending upon the current density. Examples of the degree of polish obtained by this treatment are shown in Figures 2, 3, 5, and 6. It will be noticed that the higher carbon content steels are not given as good a polish as the stainless and low carbon steels. The degree of polish can be semi-quantitatively estimated from the reflected light shown in Figures 5 and 6.

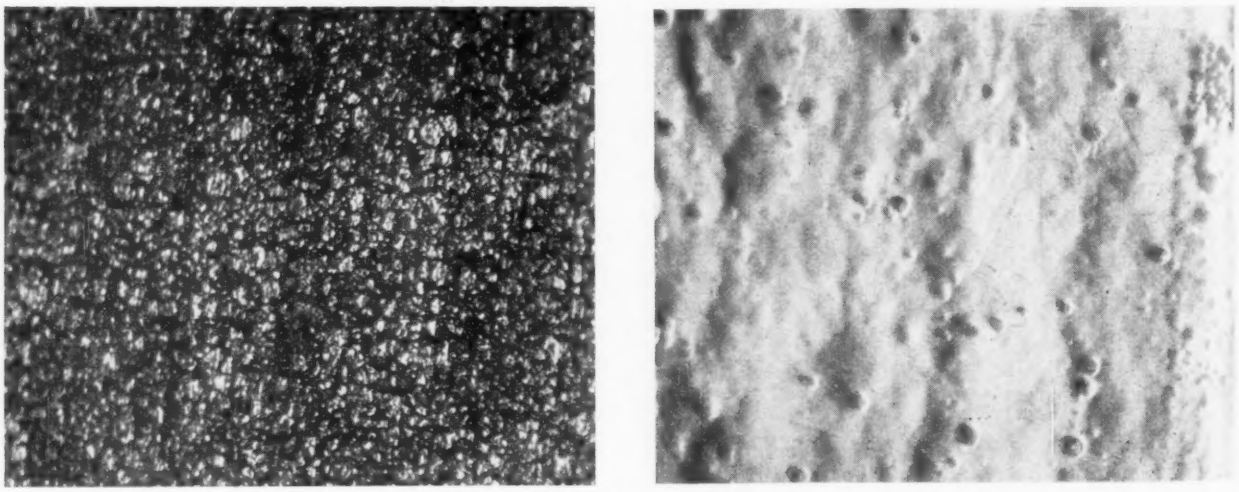
Fluosulfonic acid contents higher than 30 per cent require excessively high current densities to polish. These large current densities serve to release obnoxious fumes from the bath (probably HF) and thus to limit its usefulness. Moreover, these excessive current densities tend to cause pitting of the metal. From an industrial point of view they are not desirable also because they tend to liberate large quantities of heat which call for artificial cooling that is expensive, and such baths demand high current sources which is also expensive.

The addition of water to these baths does not produce any desirable change in the polishing procedure. However, the baths will still polish, up to water concentrations of about 27 or 28 per cent.

Baths containing fluosulfonic, phosphoric acids and water can be used to polish 18-10 stainless steels. However, the water can be omitted and the results obtained are just as good or better. Hence the water serves no useful purpose and may be omitted unless "drag out" is a problem.

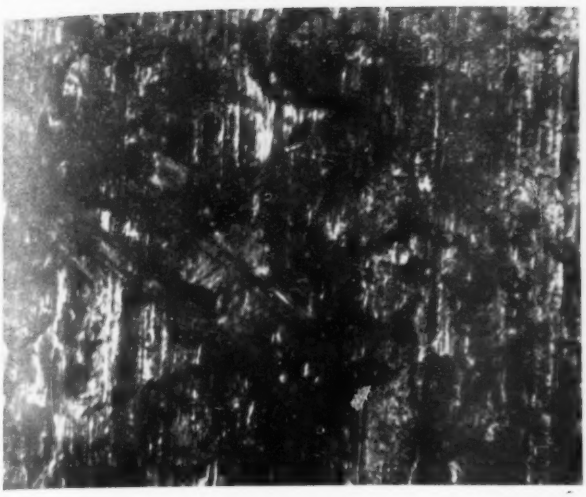
The temperature of the baths can range from 20 to 70° C. (68 to 158° F.) with no deleterious effect upon the polishing. It is advisable to keep the temperature below 60 to 65° C. (140 to 149° F.) because of the danger of pitting due to obnoxious gases which are liberated at this temperature. Also, the solution is not very stable above temperatures of 70 to 80° C. (158 to 176° F.). It should be pointed out that above 75 to 80° C. (167 to 175° F.) these solutions liberate HF spontaneously.

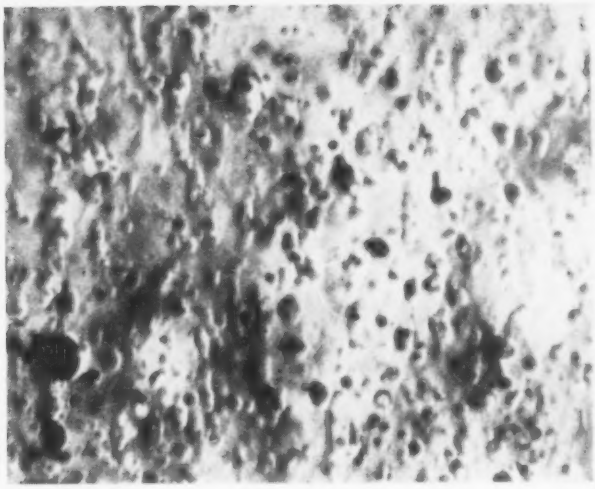
The solutions involving fluosulfonic acid, phosphoric acid, chromic oxide and water polish 18-10 stainless steel, nickel and nickel alloys fairly well. Concentration limits for these solutions range from 5 to 20%



Before — Figure 2. 18-10 Stainless Steel — After

Polishing data: Solution: 10% HSO_3F, 90% H_3PO_4; Current density: 1050 amps./sq. ft. (345 amps./sq. dm.); Time: two minutes; Temperature: 25 to 57° C. (77 to 135° F).





Before — Figure 3. Low carbon steel — After

Polishing data: Solution: 10% HSO_3F, 90% H_3PO_4; Time: Seven minutes; Current density: 450 amps./sq. ft. (148 amps./sq. dm.); Temperature: 50 to 90° C. (122 to 194° F.)

HSO_3F, 60 to 90 per cent H_3PO_4, zero to 27 per cent water, and 0.6 to 8.5 per cent chromic oxide, for nickel and nickel-silver. Higher contents of water or fluosulfonic acid than those indicated result in either pitted surfaces or decomposition of the solution.

The temperature of these solutions, like the previous series, is not very critical. Good operation can be expected over a temperature range of 20 to 70° C. (68 to 158° F.). Also, as in the previous solutions, the temperature should be kept below 70° C. (158° F.) so as to prevent pitting and decomposition of the solution.

An unusual feature of these solutions is the fact that polishing can be obtained at a very low current density. For instance, in Table V, No. 7, a fairly good polish was obtained by using only 120 amps/sq.ft. (39.4 amps/sq.dm.) for ten minutes. This is true only of the 18-10 steel and not for nickel. The type of polish that can be expected from these solutions is shown in Figures IV and VI which illustrate their action upon nickel and nickel-silver. It can be seen in Figure III that this solution etches the metal very slightly. This slight etch does not interfere with the degree of polish to any serious extent.

The series of solutions formed by using fluosulfonic acid, phosphoric acid, sulfuric acid, and water were investigated next. This series is of no great importance because the solutions polish whether or not the fluosulfonic acid was incorporated into them. As a matter of fact, it was possible to use a lower current density to obtain a polish using the solutions without fluosulfonic acid. If fluosulfonic acid was present, a higher current density was required.

However, for purely theoretical interest, it may be well to indicate that polishing could be obtained at the following concentration limits: 10 to 30 per cent H_2SO_4 and zero to 20 per cent water, using current densities ranging from 110 to 2100 amps/sq.ft. (36 to 690 amps/sq.dm.) for one to three minutes at a temperature of 20 to 70° C. (68 to 158° F.).

Fluosulfonic acid and acetic anhydride showed no promise whatsoever of being useful as polishing solutions for carbon steels. All solutions tried had an extremely high resistance which permitted only low current density values to be used. Moreover, these solutions fumed excessively.

The same was true of fluosulfonic acid and perchloric acid solutions for polishing carbon steels. The resistance of these solutions was much less than with the acetic anhydride solutions. However, these solutions evolved copious fumes also.

Fluosulfonic acid, sulfuric acid and water baths did not produce good results when used for polishing 18-10 stainless steel. All concentrations tried showed no polishing action but did etch, pit the metal or at most give a satin finishing action. Concentrations ranged from 10 to 30 per cent HSO_3F, 40 to 90 per cent H_2SO_4 and 1 to 20 per cent water. Current densities ranged from 100 to 500 amps/sq.ft. (32.8 to 164 amps/sq.dm); times from one to three minutes; and temperature from 28 to 69° C. (82 to 156° F.). Most of these solutions also evolved a large amount of obnoxious fumes.

Among the anodes tried in the miscellaneous solutions were aluminum, brass, beryllium copper, Muntz metal, nickel, nickel-silver, low carbon steel, high carbon steel, and stainless steel. Muntz metal can be given a fair polish using 125 amps/sq.ft. (41 amps/sq.dm.), for one to two minutes at a temperature of 26° C. (79° F.) in a solution consisting of 9.6 per cent HSO_3F, 6.8 per cent chromic oxide, 55.6 per cent water, 20.8 per cent sodium dichromate, and 6.9 per cent acetic acid.

Nickel can be given a fair polish using a current density of from 460 to 620 amps/sq.ft. (151 to 203 amps/sq.dm.) for one to two minutes at a temperature of 33 to 40° C. (91 to 104° F.) in a bath consisting of 10.8 per cent HSO_3F, 75.4 per cent H_3PO_4, 12.5 per cent water, and 1.25 per cent chromic oxide.

Operating Life

The operating life of these baths will depend upon whether or not chromium is present in the solution.

If chromium is present, either at the start or through use, then the operating life will be comparatively short as stated previously. One 100 cc bath, containing 90 per cent H_3PO_4 and 10 per cent HSO_3F, used for 18-10 stainless steel, was used for 250 ampere-minutes and was still polishing satisfactorily. Using nine ampere-minutes for each square inch of steel, this means that at least 27.8 square inches of steel were polished with this 100 ml. portion of solution.

A fresh bath of the same composition was used on an S.A.E. 1070 steel for 540 ampere-minutes and still showed fairly good polishing characteristics. Using 30 ampere-minutes for each square inch of steel, this bath was capable of polishing over 16.6 square inches of 1070 steel. Since in this case no chromium is present to start with or through use, the bath has a fairly long operating life. As it is used, however, it has a tendency to foam a great deal due to the gas evolution at both electrodes and the increasing viscosity due to metal ion concentration. This can be minimized by putting in a drop of 10 per cent Aerosol solution for every 100 ml. of solution. Also, as the solution is used, it would be advisable to add additional amounts of HSO_3F to replace that lost by hydrolysis and subsequent evaporation of the HF until the total H_2SO_4 content reaches 30 per cent. At this point it will no longer polish satisfactorily.

Mechanism of Polishing

The mechanism of polishing seems to be simply a hydrolysis of the fluosulfonic acid into sulfuric acid and hydrofluoric acid. The water is obtained from the phosphoric acid or from the water added to make up the bath. Although no tests were found which could detect the fluosulfonate radical in the presence of phosphate, sulfate, and fluoride radicals, a roundabout method was used to ascertain whether or not this was true.

By calculation, using the following equation as representing the hydrolysis of the fluosulfonic acid:

$$HSO_3F + H_2O = H_2SO_4 + HF$$

it was determined that there was enough water in the 90 per cent H_3PO_4–10 per cent HSO_3F bath to cause total hydrolysis of the fluosulfonic acid.

Calculations

Phosphoric acid 85%, specific gravity—1.71.
Fluosulfonic acid, 96%, specific gravity—1.73.
$(90) \times (0.85) \times (1.71) = 131$ grams of H_3PO_4.
$(90) \times (0.15) \times (1.71) = 23$ grams of water.
$(10) \times (96) \times (1.73) = 16.6$ grams of HSO_3F.
$(10) \times (0.04) \times (1.73) = 0.7$ grams of H_2SO_4 (impurity in HSO_3F).
$(16.6) \times (18)/(100) = 2.98$ grams of water required to hydrolyze the 16.6 grams of fluosulfonic acid.
$(16.6) \times (98)/(100) = 16.3$ grams of sulfuric acid formed.
$(16.6) \times (20)/(100) = 3.22$ grams of hydrofluoric acid formed.

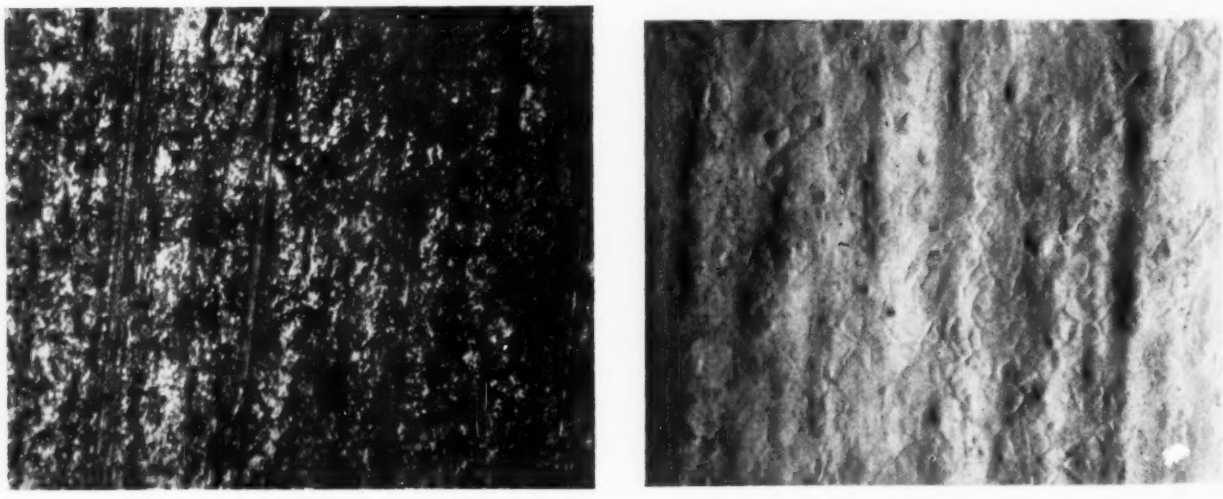
Consequently, assuming complete hydrolysis, the final solution would contain 131 grams of H_3PO_4, 20 grams of H_2O, 17 grams of H_2SO_4, and 3.2 grams of HF.

A new solution was then made using the above quantities; then, using the same current density and time as for the 90 per cent H_3PO_4–10 per cent HSO_3F solution, a piece of 1070 steel and a piece of 18-10 steel was polished in this bath. Both pieces of metal polished about the same as would be expected from the fluosulfonic acid solution.

Thompson[37] states that hydrolysis for samples of fluosulfonic acid containing five to ten per cent is practically instantaneous. For other concentrations, hydrolysis is usually complete in two hours.

Materials of Construction

Although the pure acid can only be stored for long periods of time in high silica content glass vessels, it is possible to keep fluosulfonic acid in mild steel vessels if they are vented at least once monthly. However, in the case of the polishing solutions themselves, the percentage of fluosulfonic acid is so small that the



Before Figure 4. Nickel silver After

Polishing data: Solution: HSO_3F—10.9%; H_3PO_4—75.3%; H_2O—12.6%; CrO_3—1.3%; Current density: 645 amps./sq. ft. (21.2 amps./sq. dm.); Time: Three minutes; Temperature: 30 to 55° C. (86 to 131° F.)

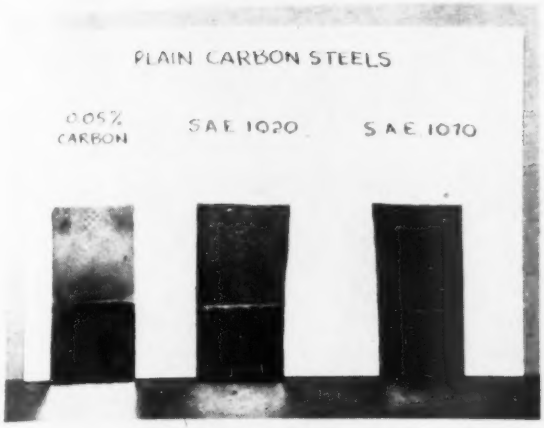


Figure 5. Solution used: 10% HSO_3F; 90% H_3PO_4; Current density: 0.05% C 450 amps./sq. ft. (14.8 amps./sq. dm.), S.A.E. 1020-445 amps./sq. ft.) (14.6 amp./sq. dm.), S.A.E. 1070-510 amps./sq. ft. (16.7 amps./sq. dm.); Time: Seven minutes, five minutes, six minutes, resp.

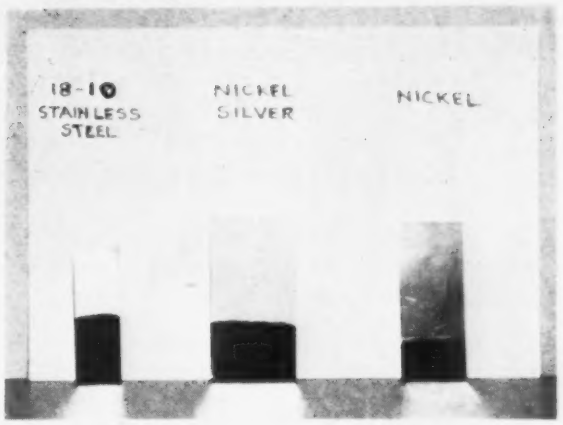


Figure 6. Solutions Used: 1. 18-10 Stainless Steel: 10% HSO_3F, 90% H_3PO_4, 1030 amps./sq. ft. (33.8 amps./sq. dm.), 2 minutes; 2. Nickel silver: HSO_3F 10cc, H_3PO_4 70cc, H_2O 20cc, CrO_3 2g, 645 amps./sq. ft. (21.2 amps./sq. dm.), 3 minutes; 3. Nickel: Same solution as nickel silver. 825 amps./sq. ft. (27.1 amps./sq. dm.), 1 minute.

usual tanks of stainless steels, nickel, or lead can be used to hold them. Moreover, the fluosulfonic acid concentration will be even less because of hydrolysis.

Economics

The price of fluosulfonic acid is 7.5¢ per lb. in 55 gallon steel drums and 6.0¢ per lb. in tank cars. For polishing stainless steels, therefore, it would be cheaper to use a bath containing the usual 60-20-20 ratio of phosphoric acid, sulfuric acid, and water than a bath containing phosphoric acid and fluosulfonic acid. For example, the price of one gallon of the fluosulfonic acid polishing bath (10 per cent HSO_3F and 90 per H_3PO_4) is approximately $1.50 when dealing with quantities of the order of 500 gallons. The cost of one gallon of the 60-20-20 for phosphoric, sulfuric, water polishing bath is about $0.98 for the same quantity lot. These figures do not, however, take into consideration the patent situation which would bring the prices nearer each other.

The following cost values were used in the above computations:

H_3PO_4, USP, 100 pound carbons, 11¢ per lb.
H_2SO_4, 66° Be., tanks, $16.50 per ton.

However, for the polishing of carbon steel where the baths so far known call for the use of chemicals such as perchloric acid, ethyl alcohol, chromic acid, lactic acid, maltose, and the like, the fluosulfonic acid-phosphoric acid baths compare favorably in price.

Conclusion

The use of fluosulfonic acid as an electropolishing agent has been investigated and the following results obtained:

1. For polishing stainless steels the following baths can be used:
   a. Five to ten per cent fluosulfonic acid and 90 to 95 per cent phosphoric acid used with a current density of 140 to 1000 amps./sq. ft. (46 to 328 amps./sq. dm.), two to five minutes at temperatures between 20 and 70° C. (68 to 158° F.).
   b. Five to twenty per cent fluosulfonic acid, 60 to 90 per cent phosphoric acid, zero to 27 per cent 0.6 to 15 per cent of chromic oxide was used with a current density of 120 to 1200 amps./ sq. ft. (39.4 to 394 amps./sq. dm.), fifteen minutes at temperatures between 20 and 70° C. (68 to 158° F.).
   c. Solutions composed of fluosulfonic acid, sulfuric acid, phosphoric acid and water are of no importance because these solutions will polish whether the fluosulfonic acid is present or not.
   d. Solutions composed of fluosulfonic acid, sulfuric acid and water would not polish stainless steel.
2. For polishing plain carbon steels the following solutions can be used:
   a. Five to ten per cent fluosulfonic acid and 90 to 95 per cent phosphoric acid used at a current density of 140 to 2200 amps./sq. ft. (46 to 722 amps./sq. dm.), for three to fifteen minutes at temperatures between 20 to 70° C. (68 to 158° F.).
   b. Fluosulfonic acid and perchloric acid mixtures would not polish carbon steels.
   c. Fluosulfonic acid and acetic anhydride mixtures would not polish carbon steels.
3. For polishing nickel and nickel-silver the solution and conditions stated in 1(b) can be used.
4. None of the other anodes used—beryllium copper, 70-30 brass, Muntz metal, and aluminum—were found to be polished in any of the aforementioned baths or in any miscellaneous baths prepared.

Disposal of Cyanide Wastes

Conclusion

By John G. Dobson, *Wallace & Tiernan Co., Inc., Newark 1, N. J.*

AT ABOUT the same time Albright and Friel[24] designed and built the first plant in this country using alkaline chlorination.

The exact chemistry of the reaction is still not completely understood. Cyanogen chloride (CNCl)[24] and cyanates have been suggested as intermediate products. Ammonium carbonate,[24] nitrogen and nitrous oxide have been suggested as the final product of the reaction.

Recent work in the laboratory has indicated that the addition of 3.5-4.0 parts of chlorine per part of CN in dilute solutions at pH 8.5 results in a rapid reaction that for all practical purposes is completed within one minute, leaving at the end of this period an excess of chlorine in the form of free available chlorine. The presence of this residual at pH 8.5 or greater signifies that the cyanide has been removed.

A second reaction between the products of this first reaction, which include cyanates[20] and an additional 4 parts of chlorine per part of CN, will take place in about 1 hour.

Before sufficient chlorine has been added to completely neutralize all the cyanide present, standard tests made with the ortho-tolidine reagent, in accordance with the APHA methods, indicate the presence of approximately 0.5 ppm. of combined available chlorine or chloramine in the solution. However, when the cyanide has been completely eliminated, the addition of a slight excess of chlorine results in the formation of free available chlorine residuals which can be readily determined by the standard ortho-tolidine-arsenite test.

Further laboratory work will be necessary before the exact chemistry of these reactions can be fully understood.

However, the waste which results from the first step in such chlorination has been tested on living fish and on sewage sludge digestion under controlled laboratory conditions, and has been found to have a toxicity equivalent to the cyanate content, i.e., about 1/1000 the toxicity of the equivalent concentration of cyanide.

The ortho-tolidine test for chlorine as a measure of the freedom of any particular waste from cyanide should only be used after it has been verified that the presence of free chlorine residual is a true measure of the freedom from cyanide radical for that particular waste. In the presence of other plating salts, and particularly in the presence of chrome, the ordinary ortho-tolidine reaction is unsatisfactory. The following method of titration represents a modification of the Hallinan method:

Place a sample on each of the two 15 ml. standard colorimetric cells of a chlorine color comparator. To the titrated sample add .7 cc. ortho-tolidine-reagent. Immediately thereafter add .75 cc. of 5 gm./liter sodium arsenite solution to both samples. Compare the resulting color solution against standard glass indicators. This method has the advantage of permitting the reaction between the chlorine and ortho-tolidine to give standard color indications. However, the addition of sodium arsenite immediately following the ortho-tolidine causes a reaction between the chrome ion and complex chlorine compounds with the sodium arsenite, rather than with the ortho-tolidine, and gives an indication of free available chlorine. In view of the slow speed of decomposition of cyanogen chloride,[26] it would appear that the method also effectively excludes that complex if it is present.

The test has been compared with standard idiometric titration. It was assumed that the difference in titration without phenol and with an equal volume of 3% phenol would yield a true chlorine residual, and the method was found to be comparable. This method gives a ready and quick analytical method for the determination of free chlorine under these conditions.

The elimination of the cyanide radical by chlorination has been verified by extensive experimental work during the years 1944 and 1945. Through the court-

SOLUTION	STRENGTH OF SOLUTION	RISE IN TEMP	% OF THEOR. NaCNO IN FILTRATE	NaCN IN FILTRATE	% LIME SLUDGE	FOAMING	STIRRING
NaCN	0.1%	0.5°C	92.1%	NONE	2%	NONE	YES
NaCN	1.0%	12.5°C	84.8%	NONE	15%	SLIGHT	"
NaCN	3.0%	49°C	61.1%	NONE	50%	1"	"
NaCN	5.0%	85°C	16.1%	NONE	95%	3"	"
NaCN	7.0%	85°C	6.6%	NONE	100%	4.5"	NO
NaCN-Cu	5.0%	82°C	NOT DET	NONE	95%	2"	O.K.
NaCN-Cu	10.0%	82°C	NOT DET	NONE	100%	3"	WITH DIFFICULTY

Figure 6.

SOLUTION	EQUIVALENT CN CONTAINED	COPPER CONTAINED	ZINC CONTAINED	RATIO	LEFT IN SOLUTION	TIME
NaCN	106 ppm.	0	0	1:4.72	ZERO CN	HR
NaCN	2650 ppm.	0	0	1:3.45	ZERO CN	HR
NaCN CuCN	711 ppm.	360 ppm.	0	1:7.9	5 ppm. NaCN 3 ppm. COPPER	HR
$Zn(CN)_2$ NaCN NaOH	611 ppm. CN	0	450 ppm.	1:3.47	1 ppm. NaCN 1 ppm. ZINC	HR

Figure 7.

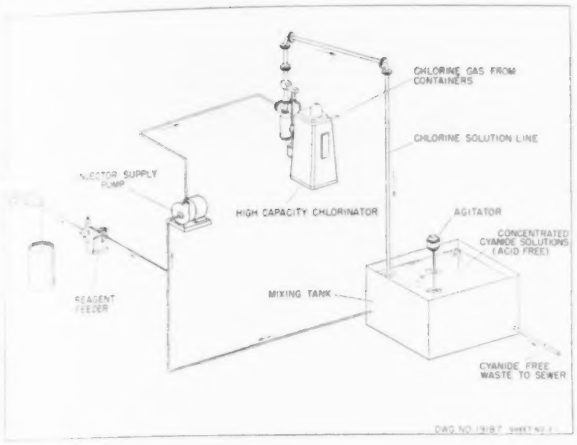


Figure 8.

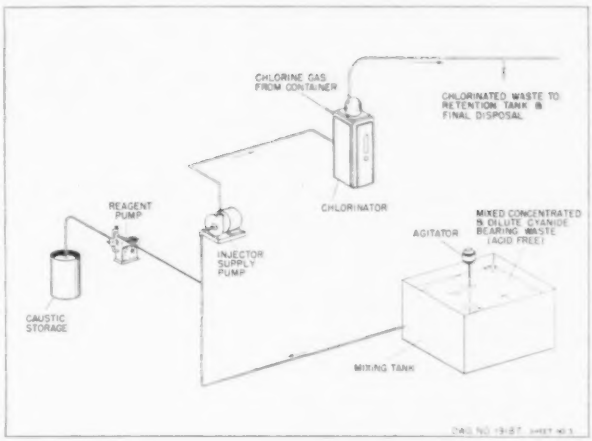


Figure 9.

esy of Mr. Manley Ross and Mr. R. C. Cliver, who did the experimental work, the results of those investigations have been made available to the writer. Various sources of chlorine were tried by this group, including bleaching powder ($Ca\ O\ Cl_2$), sodium hypochlorite ($NaOCl$), and liquid chlorine. It was found that the use of bleaching powder, while it reacted in the same manner as chlorine from other sources, presented such problems with sludge and foaming as to make it uneconomical. The results are shown in Figure 6. The experimental work with sodium hypochlorite proved that this material was a more satisfactory one than bleaching powder for practical application as detailed in Figure 7.

It is interesting to note in the data by Cliver that chlorination under caustic conditions not only effectively eliminated the cyanide, but also reduced the copper and zinc concentrations to levels sufficiently low to permit discharge of the wastes into most streams. The copper precipitated out as a black CuO which was apparently colloidal in nature and quite difficult to filter on a laboratory basis. Plant-scale operation of such treatment would probably dictate the use of suitable coagulating agents to precipitate the copper. In most cases, the amount of metal to be recovered is so small that it makes any recovery process uneconomical. Where economies can be obtained, and this would probably be true in many silver plating operations, the resulting sludge can be scraped from the bottom of the settling tank and sold for metal recovery. Often the treated waste can be reused as scrubbing or cooling water in the plant. Other chlorinating agents, including some chlorinated organics, have been tried for this process, but have proved uneconomical.

Plant Design

The design of treatment plants for the elimination of cyanide wastes by chlorination vary widely, depending upon a large number of factors. In some few cases the receiving stream or intercepting sewers are already so contaminated that the discharge of the rinse waters from plating operations or heat treating operations which may contain 3-5 ppm. of cyanide will not be in the least objectionable. In other cases, the receiving body of water has such enormous dilution power that the resulting concentrations of cyanide from the discharge of some plating or case-hardening operations will be relatively unimportant. In these cases the operating plant will only be interested in treating its concentrated dump liquors. However, any industrial plant discharging into sewers or streams which enter rivers and are later used as a source of drinking water will undoubtedly consider it desirable to treat their entire cyanide-bearing wastes. The concentration of cyanide being discharged varies widely from plant to plant, even where operations are very similar. The shape and relative size of the parts being plated or heat treated, the speed of dragout, the type of plating frames and the amount of wash water being used are but a few of the contributing factors.

The first step in the design of any plant will be to determine the concentration and variation in concentration of the cyanide radical in the particular waste. The table below indicates the general magnitude of concentrations which may be expected.

TABLE II

Type	*Concentrations*	*As*
Plating Rinse Water	1 to 25 ppm.	NaCN, AgCN, and other metal cyanides
Dumped Plating Baths	10 to 100,000 ppm.	Various metal cyanides
Heat Treating Quench Waters	50 to 100 ppm.	Sodium cyanide, sodium ferrous cyanide
Coke Oven Gas Scrubbing Water	150 to 300 ppm.	NaCNS
Mine Tailing Rinses	5 to 25 ppm.	NaCN

The treatment of concentrated cyanide wastes can best be carried out in a plant as shown schematically in Figure 8. The concentrated dump liquors are carried from the plating baths through special sewers or by portable tanks to a treatment tank outside of the plant. While it is possible to carry out this reaction in the concentrated tanks within the plant, the usual production requirements of immediate dumping of a tank which has become fouled will require the use of an auxiliary treating tank. After the waste liquor has been fed into the storage tank, the pH of the waste can be raised by the addition of sufficient lime directly into the tank or can be raised by the gradual addition of caustic as the solution is pumped from the tank. After the waste has been thoroughly mixed, it is then pumped from the tank through the injector of the chlorinator where a controlled and measured amount of chlorine is added, and the material is then returned to the storage tank. Precautions should be taken to assure the maintenance of the correct pH. This can best be taken care of by the pumping of a caustic solution with a reagent feeder directly into the circulating water. A plant using lime added directly into the mixing chamber and using city water for the addition of chlorine into the tank has been in successful operation for over a year. Frequent and careful tests by the State Supervising Authorities have failed to indicate any cyanide being discharged from this plant into the stream.

When it is desired to treat not only the concentrated waste liquor but the entire wash water from the plant, a choice must be made between continuous operation with automatic controls or intermittent fill and draw methods. For the small plant whose total volume for a day's operation can be readily stored in a reasonably sized storage tank, start and stop operation probably offers some economy. Figure 9 gives a schematic illustration of that type of plant. The mixed concentrated and dilute cyanide, freed of acid waste by separate sewage systems, is carried to the storage tank where an agitator is provided to assure reasonable uniformity of solution. The resulting mixed waste is pumped from the tank and caustic is added by a reagent pump in sufficient quantities to assure the maintenance of pH above 8.5. From there it is passed to the chlorine

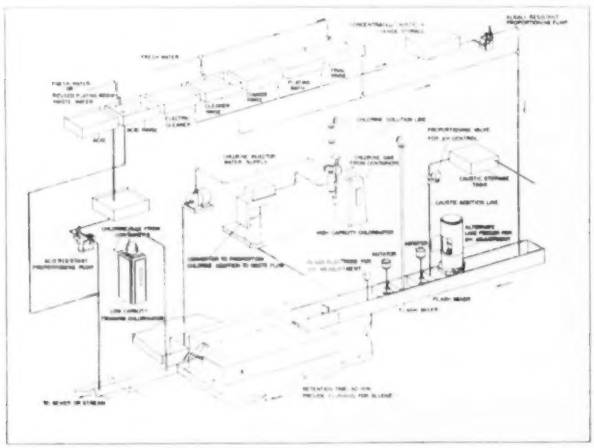


Figure 10.

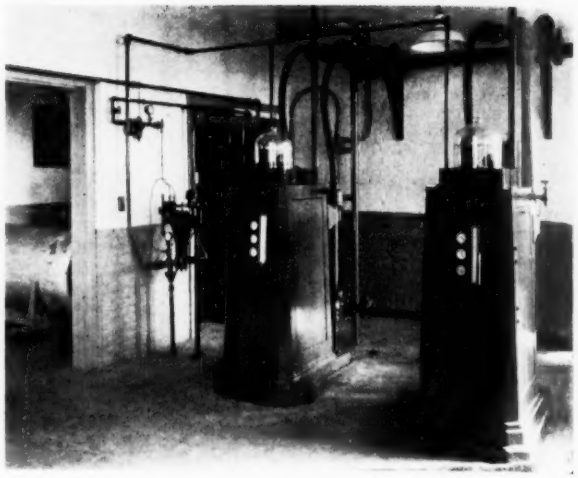


Figure 11. Heavy duty chlorinators operating at the Sewage Plant, Norwalk, Conn.

injector, mixed with the chlorine, and carried out to a storage system to allow reaction time. This storage can be provided either by a reaction tank or by flowing the wastes into a sewer free of other wastes. Sewage which contains sanitary waste with attendant natural chlorine demand, or which contains acid likely to affect the pH of the solution, should never be depended upon for a place of reaction.

In any large operation where the quantity of the waste water being discharged is large enough to preclude a reasonable sized retention tank, continuous operation of the treatment plant may be indicated. Figure 10 illustrates schematically a plant of this type.

The wash water from alkaline and electrolytic cleaners, from cyanide rinses, and from plating rinses, are carried continuously to the treatment plant. If cyanide heat treating operations or other sources of dilute cyanide wastes are present in the plant, they would be combined with these wastes. The concentrated cyanide waste, including dump solutions of the cyanide rinse and dump plating bath solutions, are carried in a separate sewer into a storage tank and proportioned into general waste systems by a reagent pump. The resulting mixture in most plating operations would contain 50-100 ppm. of CN. The addition of chemicals to this solution can either be carried out in a flume, as indicated in the schematic drawing, or in an actual pipe line, whichever seems most economical.

Where the waste solution is to be re-used for cooling water or for other rinse water, the operation of the entire system under pressure is probably advisable. In any case, the alkali, such as sodium hydroxide (caustic) or hydrated lime, is added to the flowing stream at a rate sufficient to hold the pH at the required value. The choice of NaOH or CaOH or others is a matter of balancing the lower cost of the lime against the ease of feeding of the liquid caustic and the lack of sludge formed. The calcium salt can well be used when automatic dry-feed equipment can be justified.

The caustic is added by a proportioning valve or dry chemical feeder controlled by standard glass electrodes, located beyond the point of chlorination. Chlorine is then added, using either city water or

pumped plant effluent for operation of the chlorine injector. Addition of the chlorine is maintained proportionately to the flow through the system.

Retention tanks are next provided to hold the plant effluent for a period of approximately 30 minutes. This gives an adequate margin of safety over the normal requirements for completion of the reaction. As an added safety feature, an additional low capacity chlorinator can be provided in the effluent flume or midway through the retention tank to permit supplementary chlorinization in case the increases of cyanide content require higher proportions of chlorine than have been provided in the initial operation.

Beyond the point of secondary chlorination, the acid rinses are added, and the concentrated acid dump solution pumped in with a reagent feeder. In many operations, this secondary addition of waste acid is approximately the correct amount to build the plant effluent back to neutral pH.

The chlorine demand (the amount of chlorine that must be added to obtain free available chlorine residuals) of plating room waste will usually be almost equivalent to the amount required to react with the cyanide. However, certain alkali cleaners contain sulfites which will increase the amount of chlorine required. Also, if degreasing or solvent cleaning is used in the plant, the waste from that operation will add substantially to the chlorine demand.

Some excess chlorine must be used to force the reaction to completion. If the discharge of the plant is added to domestic sewage or to most streams, the natural chlorine demand will more than absorb any possible excess chlorine.

Conclusion

This comparatively new process for the elimination of highly toxic cyanide waste in streams is apparently very successful. In no operating plant has any failure occurred. The design factors which have proved successful in previous plants will have to be translated into plants adapted to the particular problems involved in the newer treatment plant.

Acknowledgment

The writer wishes to express his appreciation to Mr. Manley Ross of the Electrochemical Department of E. I. du Pont De Nemours & Co., for his encouragement and many helpful suggestions; to Mr. R. C. Cliver of the same company for his permission to publish, for the first time, the results of his careful laboratory work on the lime, sulfur and chlorine methods; to Dr. H. C. Marks, director of the Wallace and Tiernan research laboratories, for his development of the method of chlorine determination in the presence of chrome ions; to Mr. N. S. Chamberlin for his assistance in studying the chlorine-cyanide reaction; and to Mr. A. E. Griffin for his helpful assistance and suggestions, and painstaking review of the manuscript.

FINISHING COPPER BY OXIDATION

(*Concluded from page* 63)

finish be augmented by the addition of a wax, lacquer, or oil organic coat.

Finishes produced by the oxidation process can be readily removed by dipping in hydrochloric acid (muriatic acid) preferably using a mixture of 1 volume of acid and 2 volumes of water.

Copper-Plated Work

Work that has been copper-plated is readily blackened by the process. Since approximately 0.00005" of copper is removed from the surface during blackening, the plating thickness should be about 0.0001". This thickness can be obtained by plating for about 10 minutes at 10 amp./ft.^{2}, or 20 minutes in a plating barrel. Grey areas will be present after blackening if the plating is not thick enough. However, with the proper thickness, uniform, jet black finishes should be obtained in from 5 to 8 minutes. The work should not be left in the solution more than 3 minutes after a jet black color has been obtained, nor usually more than a total of ten minutes.

Colored Finishes Produced by the Oxidizing Process

In addition to blackening copper, the process can be used to form colors which are chemically stable and more durable than the sulphide finishes. The colors which may be obtained depend upon the copper content of the base metal or alloy. Brasses, particularly electroplated rolled brass containing 65% copper or more, can be colored gold, blue, blue-green, peacock, green-brown (Old English) and brown (Statuary Bronze).

As in blackening, the colors are formed by direct oxidation of the base metal and are extremely adherent. They will not flake and are chemically stable indoors. However, they should be lacquered for long life and protection against mechanical wear. Unlike sulphide finishes they do not spot or fade.

Before immersion, the work should be cleaned in a nontarnishing alkali cleaner and rinsed. For high quality finishes the surface should also be buffed. The work should be immersed in a solution held at between 130° and 180° F. containing one pound per gallon of oxidizing salts. What colors will be produced depends upon the temperature of the solution, the concentration of salts, and the immersion time. Immersion time is 15 seconds for gold color, 30 seconds for blue, and about two minutes for statuary bronze. After immersion, the work should be rinsed, dried, and lacquered.

These colors possess a depth not possibly obtainable by either colored lacquers or sulphide finishes and are therefore finding a wide variety of uses. They are ideal for lamps, lighting fixtures, hardware, buttons, buckles, eyelets, snaps, grommets, tacks, screws, nails, vases, urns, cosmetic cases, wire screens, name plates, and so on. The coloring process is not limited to copper and its alloys, for anything that can be brass-plated can be colored.

Los Angeles Plating Plant Explosion

By Fred A. Herr, *Los Angeles Correspondent*

EXPLOSION of perchloric acid being used for electrolytic polishing of aluminum Army furniture was attributed by Los Angeles Fire Department and insurance company investigators as the cause of the devastating blast which on February 20 destroyed the plant of the O'Connor Electro-Plating Corporation, Los Angeles, killing 15 persons and injuring an estimated 150.

The explosion, which occurred at 9:45 a.m. with what has been described as atomic-like force, not only virtually obliterated the one-story brick building which housed the O'Connor plant at 922-30 East Pico Boulevard, but completely wrecked a number of immediately adjacent structures and damaged an estimated 300 buildings within a 1½ block area.

Appearance of a detail of Army photographers shortly after the explosion gave rise to reports that the plating plant was engaged in secret work for the military. The uniformed men photographed every damaged structure in the blast area, which is said to be the usual procedure to a lengthy report when a liability of damage against the Army is anticipated.

R. J. O'Connor, co-owner of the company, declared that no secret process was being employed and that the firm was not doing any secret Army work, but was plating furniture for the Timm Manufacturing Company of Burbank, California, which firm had a contract with the Army.

(Acme Photo)

View showing twenty-five foot crater formed by explosion of electropolishing tank containing perchloric acid-acetic anhydride and aluminum.

That explosion of perchloric acid precipitated the blast was conceded the following day by Los Angeles Fire Department and insurance company investigators who attributed failure of the O'Connor Company's refrigeration system, which held the acid to required temperature, as the immediate cause.

A chemist representing the insurance company disclosed that it had been definitely determined by February 21 that the plant had been using a solution of perchloric acid and acetic anhydride for electropolishing aluminum. The tank in which the perchloric-anhydride solution was contained was a 4 x 4 x 6 foot tank of 96 cubic foot capacity, with a volume of 700 gallons.

This solution, he pointed out, must be kept under constant refrigeration and permitted to rise no higher than 80 degrees Fahrenheit. Insurance investigators as well as Los Angeles Fire Department officials were agreed that failure of the refrigeration plant precipitated the explosion of the acid.

This theory is bolstered, they claimed, by the fact that surviving employees reported that some of the men and women working in the shop had started to bolt from the premises within a matter of seconds before the explosion occurred when news of the breakdown of the cooling system reached them.

Dr. Robert M. Magee, missing plant company chemist, is reported to have expressed his fear of the tremendous potentialities of the acid by commenting a week previously to fellow workers "I wouldn't want to be around when it takes off."

Lending further credibility to the perchloride theory, R. F. Thompson, arson investigator for the Los Angeles Fire Department, declared that additional evidence that the acid was responsible for the explosion was the fact that a giant crater was found at the very spot where the perchloride-anhydride tank was kept in the shop.

An earlier theory had been advanced by Thompson after consultation with Dr. Herbert Waterman, professor of chemical engineering, University of California, at Los Angeles. Thompson reported that Dr. Waterman had advanced the suggestion that the blast

could have been touched off by the perchloric acid coming into direct contact with any organic material.

This theory was considered on the first day of the investigation when Thompson disclosed that an O'Connor Company employee who survived the accident had reported to him that a few minutes before the explosion occurred the iron hangers on the perchloric acid tank had been replaced with plastic-coated hangers. Dr. Waterman, as well as Lee Jones, chemist for the Los Angeles Police Department, had agreed that the plastic in the hanger coatings would have contained sufficient organic material to have caused the explosion. However, this theory was discarded the following day when rising temperature of the acid, induced by failure of the refrigeration system, was decided upon as the actual cause.

A chemist for a leading Los Angeles manufacturer of plating chemicals, whom the representative for *Metal Finishing* consulted for an opinion, declared that the tragedy at the O'Connor shop should serve as a warning to platers in general not to work with dangerous and unfamiliar chemicals.

He pointed out that the manpower shortage in Southern California in the field of buffing, polishing and plating plant personnel in general, as well as the shortage in manual buffing and polishing equipment, had prompted many platers to resort to the more dangerous form of electropolishing. There are, he declared, many less hazardous methods with which equally good results can be obtained, if platers are not thoroughly familiar with the more dangerous compounds required for electrolytic polishing.

He added the comment that the use of 700 gallons of perchloric and acetic anhydride solution, which was the capacity of the O'Connor tank, is virtually unheard of in normal plating circles, and hazardous beyond conception.

Indicative of the force of the explosion, one chrome plating tank was thrown a block from the scene of the blast. In addition to completely destroying the O'Connor factory building, the blast caused damage of varying degrees to some 25 industrial and commercial structures in the immediate vicinity, destroyed or damaged some 250 small homes and apartment structures, and demolished an estimated 30 to 40 automobiles which were parked near the plating shop. Among the damaged buildings was the plant of the Ace Enameling Company, 752 East Pico Boulevard, two blocks east of the blast scene.

Among the known dead are Opal Milan, 45, head bookkeeper, who was buried beneath the falling rubble of the building while seated at her desk; and Yosho Katota, chemist. Reported missing is Dr. Robert A. Magee, chief chemist. Among the injured are Miss Lillian O'Connor, daughter of the owner, who served as manager of the company, and Robert O'Connor, the owner's son.

Miss O'Connor reported to investigators that 15 persons were in the plant, including herself, nine other women employees and five men when the explosion took place.

The O'Connor Electro-Plating Corporation has been doing all types of plated or anodic finishing work on aluminum and its alloys. The plant was equipped with facilities for nickel, copper, chromium, silver, gold and indium plating on aluminum, as well as chromium and all plated finishes on steel and brass, magnesium processing, sandblasting, and painted and baked enamel finishes.

(Acme Photo)

General view of damaged area showing aluminum furniture which was being processed when explosion occurred.

Following a conference on February 22 between O'Connor, Capt. Carl J. Halder, head of the police arson squad, Police Chemist Ray Pinker and Consultant Analytical Chemist G. L. Cheney, Pinker issued a statement in which he eliminated all other possible causes and declared that an explosive mixture of perchloric acid and acetic anhydride was definitely the cause of the blast.

Pinker stated that the conference with O'Connor had disclosed that the firm's chemist, Robert A. Magee, had been using a process of his own development for brightening aluminum. In this process the aluminum pieces were immersed in the solution of perchloric acid and acetic anhydride and subjected to an electrical charge, which eliminated the need for buffing and polishing.

Pinker revealed that O'Connor had declared that Magee was well aware of the explosive nature of the solution, that he had been using it intermittently since last September, and was in the final phases of perfecting the process before applying for a patent.

The statement explained that the process had been developed by Magee personally, and that aluminum caps for fountain pens were also being processed in the plant at the time the blast took place.

Cheney, who has frequently served as investigating consultant to the Los Angeles Police Department in investigations involving chemicals, stated:

"It seemed that the mixture itself was the most likely cause of the explosion. Perchloric acid, in itself, is stable. However, when coming into contact with any oxidizable or organic substance, it immediately becomes highly dangerous and potentially explosive. Acetic anhydride is such a substance."

Cheney expressed himself as mystified by the process

(*Concluded on page* 107)

This Is Washington

By George W. Grupp, *Metal Finishing's Washington Editor*

The Budget, Taxes and Labor

Except for Lilienthal, the atomic bomb, and a few other things which seem to have explosion possibilities, the most important problems before Congress are the budget, taxes and labor.

In considering the subject of labor, members of Congress are conscious that this country was founded and grew into a great world power upon the principles of (1) the right of private property, (2) the freedom of movement, (3) the freedom of contract, (4) the sacredness of contract, and (5) the freedom of enterprise. They recognize that the American people do not wish to be annoyed further by unions which upset the normal operation of things. They are aware that the public frowns on unions which defy the Government. They know that the people do not want industry destroyed by union lawsuits. They are not unmindful that the public does not want discriminatory legislation which favors one group over another. They are alert to the public's will that labor legislation should not be passed which will be unreasonably drastic. And they are awake to the people's desire for labor legislation which will provide fair play for labor, management and the public.

In an effort to satisfy the wishes of the public, Congress may be expected to pass labor legislation in March which will correct the most important aspects of the current labor problems. And since about 200 different labor bills were dropped into the legislative hopper, Congress is having a busy time studying and holding hearings on these measures preparatory to reducing them to an omnibus bill, or a series of labor measures, which will deal with labor problems ranging from collective bargaining to portal-to-portal suits.

Congressmen perceive that Judge Frank A. Picard's recent opinion overruling claims for portal pay in the Mount Clemens Pottery Company case has not cleared up the fog of the Supreme Court decision which opened up the avenue for many claims as to what will ultimately be considered a "work-week" and "work." If Congress does not define with clearness the meaning of these two terms it may even be extended to the humorous attitude of Ed who was limping badly.

"What's up?" asked Bill. "Did you hurt yourself?"

"No, I got a nail in my foot," replied Ed.

"Why don't you take it out?" asked Bill.

To this Ed exploded: "What?" "During my lunch hour?"

Corrective relief from this attitude of mind and portal-to-portal pay will not come from a reversal by the courts. Effective correction can only come from Congress.

The members of Congress are not only fully aware of their responsibility in solving the labor problems of the United States, but they are also alert to the fact that the public demands that they do something about taxes.

But in spite of this demand of the public some are wondering if the verbal skirmishing, with its profusion of words, is not reducing the enthusiasm for the much heralded 20 per cent income tax reduction.

It is the opinion of some members of Congress that substantial reductions should be made on the national debt before taxes are reduced. For example, Senator Joseph C. O'Mahoney of Wyoming has reminded Congress that the interest on the national debt for the next fiscal year will be $5,000,000,000—about $3.00 a month for every man, woman and child in the United States.

Senator O'Mahoney has asked members of Congress to study the last annual report of the Secretary of the Treasury which reveals, among other things, that the interest on the public debt of the United States has risen steadily from $658,347,613 in 1930 to $4,721,957,583 in 1946; and that the gross interest bearing national indebtedness of the United States has increased steadily from $15,921,892,350 in 1930 to $268,110,872,218 in 1946.

Senator Robert A. Taft of Ohio is aware of the dangers of our increasing national debt for he said: "there must be no increase in the national debt, but rather a steady decrease if we are to maintain solvency, and on the solvency of the government and the people's belief in its solvency depends the successful operation of our economic machine." To this he added: "we cannot have free expansion of our commerce and industrial system if it has to carry the burden of a government taking one-third of the national income." For this reason the 80th Congress hopes to reduce the Government's revenues from personal income taxes

by about $3,500,000,000. But since legislation on taxation will not be passed for several months, many changes in the minds of Congress can and will take place.

Naturally, the tax measure will be affected by the budget Congress agrees upon. President Harry Truman stands firmly for a $37,500,000,000 budget which he believes is essential for the safe operation of the government. On the other hand a considerable number of the present Congress hold that the budget must be cut for it is determined to make the budget balance in 1948—the first time in sixteen years. To what extent the President's budget will be cut is still any man's guess for at this writing it is clear that there will be a stiff fight when the committee's report is brought to the floor of the House and Senate.

Additional Senate Bills for Congressional Action

S. 57. A bill to provide every adult citizen in the United States with equal basic Federal insurance, permitting retirement with benefits at age 60, and also covering total disability, from whatever cause, for certain citizens under 60; to give protection to widows with children; to provide an ever-expanding market for goods and services through the payment and distribution of such benefits in ratio to the Nation's steadily increasing ability to produce, with the cost of such benefits to be carried by every citizen in proportion to the income privileges he enjoys. Introduced by Mr. William N. Langer of North Dakota.

S. 73. A bill to provide additional facilities for the mediation of labor disputes, and for other purposes. Introduced by Mr. Wayne Morse of Oregon.

S. 76. A bill to provide continuation of workmen's compensation in certain cases subject to the Act of February 15, 1934, and for other purposes. Introduced by Mr. Wayne Morse of Oregon.

S. 101. A bill to provide for cooperation with the State agencies administering labor laws in establishing and maintaining safe and proper working conditions in industry and in the preparation, promulgation, and enforcement of regulations to control industrial health hazards. Introduced by Mr. Olin D. Johnston of South Carolina.

S. 104. A bill to amend an act entitled "An act to supplement existing laws against unlawful restraints and monopolies," approved October 15, 1944 (38 Stat. 730), as amended. Introduced by Mr. Joseph C. O'Mahoney of Wyoming.

S. 105. A bill to make unlawful any contract or agreement making membership or non-membership in a labor organization a condition of employment, to amend the National Labor Relations Act, and other purposes. Introduced by Mr. Joseph H. Ball of Minnesota.

S. 119. A bill making unlawful the use of force or violence, or threats thereof, to prevent or attempt to prevent any person from engaging in any lawful vocation. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 120, 121, and 122. Bills to amend the National Labor Relations Act. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 123. A bill prohibiting labor organizations from making contracts or engaging in combinations or conspiracies in restraint of commerce. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 124. A bill to repeal the National Labor Relations Act of 1938. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 133. A bill to prevent the use of certain monopolistic practices in collective bargaining, to amend the National Labor Relations Act, and other purposes. Introduced by Mr. Joseph H. Ball of Minnesota.

S. 159. A bill to repeal the National Labor Relations Act of 1938. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 160. A bill to amend certain provisions of law relating to overtime pay. Introduced by Mr. W. Lee O'Daniel of Texas.

S. 161. A bill relating to hours of employment, compensation, and conditions of employment of employees engaged in interstate commerce or the production of goods for such commerce or employed in the performance of any Government contract. Introduced by Mr. W. Lee O'Daniel of Texas.

List of Current OTS Reports

The following is a list of current metal finishing reports of the Office of Technical Services, Department of Commerce, which may be had by addressing the O.T.S.:

P.B. No. 33242, *The Electrodeposition of Chromium from Chromic Acid Baths*, 64 pages, $2, microfilm; $5, photostat.

P.B. No. 37616, *Plated Precious Metal Contacts*, 32 pages, $1, microfilm; $3, photostat.

Celler on the Silver Question

Representative Emanuel Celler of New York introduced H.R. 1228 to repeal the Silver Purchase Act of 1934, and H.R. 1229 to repeal the act to extend the time within which powers relating to the stabilization fund and alteration of the weight of the dollar may be exercised. Both of these measures were introduced by Congressman Celler as he says "to repeal the nonsensical Silver Purchase Acts." On the floor of the House he declared that "recent developments have clearly indicated that the greed of a few mine owners, abetted by a powerful lobby, have sown seeds of their own destruction. Not satisfied with the exhorbitant price of 71.11 cents per fine ounce as fixed by the Federal statute, the silverites demanded and received 90.50 cents per fine ounce. The new law requires the Treasury to buy silver mined by American companies at 90.50 cents and permits to sell its surplus silver at the same price. This was practically a hold-up. Then came the boomerang. Countries like China, Mexico and India found the new prices too attractive. India replaced its silver coins with nickel and sent the silver to the United States market. Britain followed suit, substituting copper-nickel token for silver coins and also dumped its silver in the American market, tons of which are now begging for buyers. Silver came pouring in from Spain, China, Russia, the near East,

Mexico, from the four corners of the earth. The price dropped. The market price today, fixed by the silver brokers is 78¾ cents. This is almost 12 cents below the price fixed by law. The end is not yet in sight. The price will go lower. Meanwhile, Uncle Sam must pay 90.50 cents per ounce."

Tin Order Amended to Ease Matters

The Office of Temporary Controls, Civilian Production Administration, on February 6, 1947, revoked Direction 1 to Conservation Order M-43; and it amended Order M-43. The important changes in Order M-43 are: (1) permission to use tinplate of specified weights for domestic kitchen equipment; (2) permission to use 0.25 pound tinplate for the closures and crowns which formerly had to be made from blackplate; (3) tin oxide may now be used to make earthenware plumbing fixtures; (4) tin may now be used to plate hooks and eyes and snap fasteners; (5) an increased amount of tin may now be used in solder; (6) the 30-day inventory on babbitt, solder and other alloys has been revoked; and (7) the 6,000 pound small-order exemption from CPA allocation has been reduced to 4,000 pounds.

Nathan Predicts Depression in 1947

At a recent meeting of the District of Columbia Junior Bar Association, Robert R. Nathan, of CIO increased wages and lower prices fame, predicted a nine-months' depression in 1947 which would not be as serious as the one of 1920-21. This he followed up with the prediction that there will be a serious depression in the United States about 5 years hence if we neglect to "do something in these boom times."

Bill Introduced to Make Scientific Information Available to Industry

Senators Aiken and Fulbright introduced S.493 as Senator Fulbright says, "to provide for the coordination of agencies disseminating technological and scientific information, and for the more efficient and orderly administration of a program to make discoveries of engineers, inventors, scientists, and technicians more readily available to American industry and business."

Information Sought on Electroplating Developments

Mrs. Liesel May, who represents the Kromin Plating Works, May & Martin, 47 Little Latrobe St., Melbourne, C.1, Australia, will be in the United States until July 1st seeking information on the latest developments in electroplating and metal goods required for home building and home furnishing. While in this country she should be addressed at 2510 East Menlo Blvd., Milwaukee 11, Wisc.

Protective Coatings for Magnesium

The Office of Technical Services of the Department of Commerce now has on sale 45 reports on the results of American wartime research on magnesium metallurgy. One which should be of special interest to readers of *Metal Finishing* is entitled "Protective Coatings for Magnesium and Its Alloys" and comes in two parts. P.B. 12144, 9 pages, $1.00 for photostatic copy. P.B. 12145, 29 pages, $2.00 for photostatic copy.

Corrosion Tests Being Conducted at Hampton Roads

The Division of Metallurgy of the National Bureau of Standards is active in the making of tests and studies on the corrosion of metals, and especially metals used in the construction of aircraft. Aluminum and magnesium alloys are being tested in a marine atmosphere and periodic exposure to sea water at Hampton Roads, Va. The specimens include a variety of alloys and protective coatings.

Standards Bureau Making Humidity Corrosion Studies

The National Bureau of Standards is making studies on the effects of humidity on corrosion of stored ordnance materials.

Soda Ash and Caustic Soda to Be More Plentiful by Next Summer

The Department of Commerce reports that the supply of soda ash, caustic soda and chlorine will be more plentiful during the latter half of 1947. The scarcity of these commodities is said to be world-wide.

Tin Allocations Reduced

At a meeting of the Combined Tin Committee during the latter part of January, 1947, the members recommended that the tin allocations for the first half of 1947 should be fixed at about 50 per cent of the allocations recommended for the last half of 1946 to keep supplies moving until more information on supply is available.

Murdock Opposed to Removal of Copper Duty

Senator Murdock of Arizona on the floor of the Senate opposed the move to remove the excise tax on copper by stating that "I believe that the removal of the 4 cents-per-pound duty on copper would close copper mines in America, for I know none that can produce copper as cheaply as it can be produced in South America with peon labor. That 4 cents-per-pound duty marks the difference between prosperous western cities buying eagerly every manufactured article and stagnant communities with people on relief."

Sulphuric Acid Concentrator Plant for Sale

The War Assets Administration is offering to sell a sulphuric acid concentration plant and its equipment, located at Copperhill, Tenn. This plant was designed for a daily production of 286 tons of 93 percent sulphuric acid, using 2,420 gallons of fuel oil with a phuric acid, from 76 per-cent sulphuric acid, using 2,420 gallons of fuel oil with a rating of 133,000 BTU per gallon and about 200 gallons of cooling water per minute.

Shop Problems

METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Polishing Compounds

Question: Will you be good enough to advise me where I can get full detailed information, and likewise the formulas for general lines of buffing and polishing compounds. If there are any books containing this information, I will be glad to purchase them through you.

C. E. J.

Answer: We do not know of any books on this subject but in 1937 the duPont Company published a bulletin on buffing cups. We would suggest that you communicate with this company to see if they still have copies available.

Tumbling and Burnishing

Question: In the course of the manufacture of jewelry I have naturally heard of terms such as tumbling, burnishing and deburring. However, I must confess that the above are only terms to me and at present I believe that one of our greatest finishing difficulties could be overcome if I could learn the rudiments of the above processes.

Could you suggest some source of reading material so that I may acquaint myself with the theory before attempting the more expensive practical application?

From hearsay, I believe that burnishing is probably the thing I am looking for as I am looking for a process to supplement rather than replace wheel finishing. So I would appreciate particular emphasis on burnishing in all its phases.

J. K.

Answer: The literature does not have too much formal material on these subjects. In recent years the larger manufacturers of such equipment have issued booklets, pamphlets and technical advice on methods and objectives of the various processes; would suggest that you contact them for this material. An article on page 59 of the 1944 *Plating and Finishing Guidebook* contains considerable information on this subject; the 1947 issue of the same publication will have expansive material in it also.

Finishing Alloy Die Castings

Question: Could you please give me the formulas for copper plating zinc alloy castings and die cast lead alloy so they can be oxidized or nickel plated? Also would appreciate the cleaning formula.

J. A. K.

Answer: Special cleaners for zinc and lead base die castings are made by any of the standard manufacturers of cleaners; these houses will give you the complete cycle required for this type of metal. In addition, a 52-page booklet published by *The New Jersey Zinc Co.*, 160 Front St., New York 7, N. Y. entitled "The Finishing of Zinc Alloy Die Castings" covers not only cleaning, but also plating and finishing methods. The copper plating formula is the usual high speed Rochelle-salt cyanide type bath; details together with operating instructions may be had by consulting the 1946 issue of the *Plating and Finishing Guidebook.*

Zinc Plating Information

Question: Our plating is confined to Electro Zinc finish on our merchandise. Do you have any booklets available which may be helpful to us? If so, please send us description and prices to cover.

C. B.

Answer: Considerable space on this type of plating is contained in a book "Protective Coatings for Metals" by *R. M. Burns* and *A. E. Schuh.* The price is $6.50 and the book may be had by writing *Metal Industry Publishing Co.*, 11 W. 42nd St., New York 18, N. Y. The 1946 issue of the *Plating and Finishing Guidebook* also contains considerable information on the subject.

Formula Derivation

Question: In your 1946 edition of the *Plating and Finishing Guidebook* on page 165, metallic copper analysis, the figure 2.67 appears. How is the figure derived?

Answer: This figure is a conversion factor to change the 0.20 gram Cu sample to ounces per gallon. It is derived as follows:

$$1 \text{ cc. thiosulfate} = \frac{0.20 \text{ grams copper}}{\text{cc. thiosulfate required for 0.20 grams of copper}}$$

Since a 10 cc. sample of plating solution is employed:

$$1 \text{ cc. thiosulfate} = \frac{0.20 \text{ grams copper}}{\text{cc. thiosulfate required for 0.20 grams of copper}} \times 100 = X \text{ grams/liter}$$

$$= \frac{0.20 \times 100}{\text{cc. thiosulfate required for 0.20 grams of copper}} \times \frac{1}{7.49} = Y \text{ oz./gal.}$$

$$= \frac{2.67}{\text{cc. thiosulfate required for 0.20 grams of copper}}$$

Plating Cast Iron

Question: We have been zinc plating

for a number of years. Right now we have a problem; one of our very good customers has a great many cast iron handles to be plated. We simply have not been able to get an even, smooth coating over this material. We have tried numerous acids before plating; we have had various pieces shot blasted, but in no case have we yet found where the handle would plate complete. Some parts come out very beautiful but the balance remains unplated.

R. H. L.

Answer: Undoubtedly your problem is one of proper cleaning as part of the work plates satisfactorily and the rest does not. It is assumed that you give the work the regular cleaning cycle, using a muriatic or sulfuric acid dip prior to plating. Would suggest that you make up a solution as follows:

1 pint Sulfuric acid
1 pint Hydrofluoric acid
1 gallon water

Dip momentarily to one minute and use at room temperature. Use this in place of the regular acid dip and clean in cyanide by dipping prior to plating.

Oxidized Surface Preparation

Question: I am interested in oxidation. I would appreciate knowing if I may obtain the formula for sterling oxidize, green preferred.

C. R. M.

Answer: There are several formulas and methods of obtaining oxidized surfaces on silver and sterling. To obtain a complete explanation with formulas, page 168 of "Metal Coloring and Finishing" by *Hugo Krause*, published by Chemical Publishing Co., of N. Y., will give you all the information you require.

Plating Razors

Question: I am contemplating gold plating of a zinc base die cast razor. What would you suggest? There are one or two gold plated razors on the market, I would like to know the procedure.

J. M.

Answer: For this type of base metal, would suggest that you first polish and buff the die casting, plate with bright copper, nickel and gold, all bright, in that order. Formulas and methods for doing this may be secured by consulting the *Plating and Finishing Guidebook.*

Immersion Gold Plating

Question: We are plating small parts made of steel. We would like to plate these parts nickel first and then gold by immersion. Please send us the method and formula.

J. S. N.

Answer: To plate nickel, would suggest you obtain a proprietary bath from any reliable supply house or make up a bath from the *Plating and Finishing Guidebook.*

To plate gold by immersion, the following formula is recommended:

Potassium gold cyanide	½ oz.
Potassium cyanide	5 oz.
Potassium carbonate	6 oz.
Water to make	1 gal.

Place this solution in a clean jar or crock, stand in a water bath and heat gently to approximately 180 degrees F. Clean work in the usual manner, rinse thoroughly and dip in a solution of 8 oz./gal. of potassium cyanide prior to plating.

Tarnish Remover

Question: We are interested in removing tarnish from silver plated articles by some dipping method. We understand there are methods of removing tarnish by dipping into solutions other than cyanide. It is claimed that the silver plated articles will come out of the solution bright and not require any polishing.

H. L.

Answer: The tarnish film is composed mostly of silver sulfide and a practical method of removing this film is by immersing in a solution composed of approximately 10% each of sodium chloride and sodium carbonate. The part should be placed in contact with a metal container of either zinc or aluminum. The container serves as anode, the silver as cathode, and by means of cathodic action, the film is reduced to silver.

Patents

Abrasive Wheel

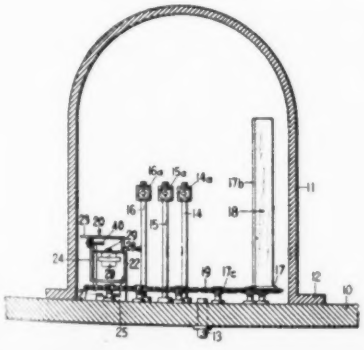
U. S. Pat. 2,414,981. *R. B. Scrimgeour, January* 28, 1947.

A flexible abrasive wheel comprising a hub and a plurality of separate bodies each formed by a haphazardly rumpled piece of abrasive-coated fabric, each of said rumpled pieces of abrasive-coated fabric having numerous portions folded upon themselves to provide in the body numerous cavities of irregular shapes distributed throughout the body, said bodies being substantially uniformly distributed around the hub of the wheel and the bodies and hub being secured together by an adhesive at the spaced small areas where the bodies make contact with one another and with the hub.

Coating Apparatus

U. S. Pat. 2,414,406. *W. H. Colbert and A. B. Weinrich, assignors to Libbey-Owens-Ford Glass Co., January* 14, 1947.

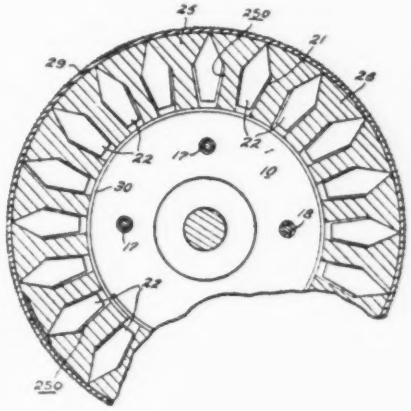
An apparatus for applying coatings to a plurality of surfaces of articles, comprising a base, a housing mounted on the base and providing with said base a chamber for the apparatus, rotatable supports for said articles for supporting the articles in upright positions, each of said rotatable supports having a sprocket adjacent its base, said supports being arranged around the inner periphery of the housing, means located within the housing for thermally evaporating materials to provide coatings by deposition, means for evacuating the chamber to create a high vacuum therein, an electric motor located within said chamber, and a sprocket chain operatively connecting the sprockets of said rotatable supports with said electric motor whereby to permit the rotation of the articles within the chamber without breaking the vacuum in said chamber.



Expansible Abrasive Wheel

U. S. Pat. 2,415,308. *J. O. Schulte, assignor to Vonnegut Moulder Corp., February* 4, 1947.

An abrading wheel having two spaced discs; means for connecting said discs in axially, aligned positions; transversely aligned guides formed in adjacent faces of the discs and each located in a radial position at the periphery of its respective disc, and having a restricted intermediate portion; transversely disposed weights having the ends thereof conforming



to, and freely mounted in, the guides; and an over-sized abrading band surrounding the outer surfaces of the weights and adapted upon rotation of the wheel to be held under tension by contact with, and the centrifugal force set up in, the weights.

Electrodeposition of Lead

U. S. Pat. 2,415,169. *A. G. Gray, assignor to E. I. duPont deNemours & Co., February* 4, 1947.

In a process for the electrodeposition of lead, the step comprising effecting electrodeposition of lead from an acidic, aqueous lead electrodepositing solution in the presence of about from .05 to 5.0 grams per liter of an anthraquinone sulfonate and 1.0 to 5.0 grams per liter of sulfite cellulose waste.

Resilient Abrasive Disk

U. S. Pat. 2,414,474. *C. C. March, assignor to Minnesota Mining & Mfg. Co.,* Jan. 21, 1947.

A flexible abrasive disk of the coated abrasive type comprising a layer of vulcanized fiber, a hard firm thermoset phenol-aldehyde resin combining bond, a layer of cloth bonded to said vulcanized fiber by said combining bond and having the fibers adpacent said vulcanized fiber firmly incorporated within said combining bond, a layer of flexible resilient impregnant comprising polyvinyl butyral within the remaining portion and at the outer surface of said cloth, a hard firm strong thermoset phenol-aldehyde resin abrasive bond adherently bonded to said outer surface of sair impregnated cloth, and a layer of abrasive grains bonded by the said abrasive bond.

Selenium Electroplating

U. S. Pat. 2,414,438. *M. C. Bloom, assignor by mesne assignments to Federal Telephone and Radio Corp., January* 21, 1947.

In a process for forming an adherent fine grain coating of metallic selenium upon an electro-conductor surface, the step that comprises electrodepositing the metallic selenium upon said electro-conductor as the anode of a pair of electrodes in an aqueous alkaline solution that comprises essentially a selenide selected from the class consisting of ammonium, alkali metal, and alkaline earth metal selenides.

Detergent Composition

U. S. Pat. 2,414,452. *J. Cunder, assignor to National Oil Products Co., January* 21, 1947.

A mild, nonirritating skin cleansing composition comprising sulfated oleic acid and an alkali metal soap of a saturated fatty acid containing at least 16 carbon atoms, said composition being substantially devoid of soaps of unsaturated fatty acids, soaps of fatty acids containing less than 16 carbon atoms, organic solvents and other skin irritating factors.

Copper Plating

U. S. Pat. 2,411,674. E. D. Wilson, assignor to Arthur D. Little, Inc., No. 26, 1946. A process of electroplating that comprises electro-depositing copper as a bright, smooth, firmly adherent deposit from an undivided cell containing an aqueous electrolyte consisting essentially of a soluble copper salt and a sufficient quantity of an alkaylene polyamine to form a complex with said salt, and a compound selected from the group consisting of lactic, citric and tartaric acids and the alkali metal salts of such acids.

Chroming Steel Articles

U. S. Pat. 2,415,078. *G. Becker, Karl Daeves and F. Steinberg, vested in the Alien Property Custodian. February* 4, 1947.

Process for the production of steel articles with corrosion-proof surfaces by therman diffusion of chromium into the surfaces consisting in making the articles to be chromed from alloys of iron containing carbon in significant amounts but less than 0.2%, chromium 0.5 to 5%, vanadium 0.3 to 3% and then chroming the articles made of these alloys by such diffusion.

Chromium Plating Patents Decision

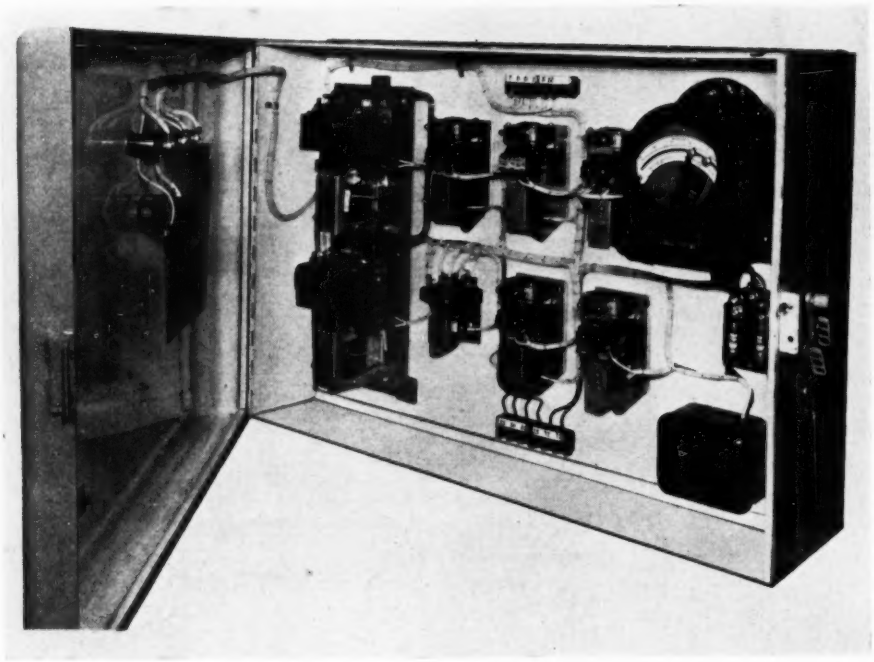
The Circuit Court of Appeals for the Seventh Circuit in Chicago on February 8, 1947 handed down a decision holding invalid two patents owned by United Chromium. This decision was on the cross-appeal from the decision of the Federal District Court for the Eastern District of Wisconsin in the suit brought by United Chromium, Incorporated, against the Kohler Company. The patents in suit were the Fink Patent, U. S. Patent No. 1,581,188, which related to the composition of the bath and which expired on April 20, 1943, and Fink Patent, U. S. Patent No. 1,802,463, frequently referred to as the Bright Plate Patent. The lower court had held the first patent valid and infringed and the second patent invalid.

Many of our readers are undoubtedly familiar with the previous decisions which have been rendered with respect to these patents. The first suit brought under U. S. Patent No. 1,581,188 was against International Silver Company in Connecticut. The patent was held valid and infringed by the District Court and this decision was sustained by the Circuit Court of Appeals for the Second Circuit in 1932. In the next suit against General Motors et al. this patent was again held valid and infringed by the District Court, but this decision was reversed on appeal in 1936, again by the Circuit Court of Appeals for the Second Circuit. In the next suit to come to trial against Great Lakes Plating & Japanning Company, U. S. Patent No. 1,802,463 was also in suit and both patents were held valid and infringed by the Federal District Court for the Eastern District of Illinois, Northern Division, in 1939. No appeal was taken. The next decision, in 1944, was that by the District Court in the Kohler case.

We understand that a petition for a rehearing in the present litigation may be presented to the Circuit Court of Appeals for its consideration. We also understand that the effect of the decision is now being considered by United Chromium, who have notified all licensees under its unexpired chromium plating patents of the decision and that United Chromium expects shortly to communicate further with its licensees regarding the modification of outstanding agreements.

Recent Developments

New Methods, Materials and Equipment for the Metal Finishing Industries



Electro-Reversal Control Unit

A mechanism to reverse the polarity and to control a selected time cycle between the positive and negative plating times is announced by the George L. Nankervis Co., Dept. MF, 5442 Second Blvd., Detroit 2, Mich., and is identified as the Nankervis Electro-Reversal Control Unit.

The unit consists of a moisture proof cabinet, in which are mounted various instruments such as complete timer controls, relays, discharge resistors, pilot lights, etc., to control the output polarity of electroplating motor generator sets. While these Electro-Reversal Units have been used for a relatively short length of time in conjunction with cyanide copper plating solutions, it is stated that users have noted the following improvements:

1. Smoother deposits made possible by reason that treeing, which usually occurs at high current density points, is immediately offset by the reversal phase of the cycle which levels off any nodules thus formed.

2. Greatly increased allowable cathode current density which will produce greater plate thickness than is obtained in the same period of time with conventional plating methods. This is possible even though part of the process employs a deplating cycle.

3. Improved plate thickness in recess or low current density areas.

4. More pore-free deposits are obtained because of the alternating plating and deplating cycle effects.

5. Brighter deposits are also obtained because of the alternating cycles that are noted above.

Polishing Lathes

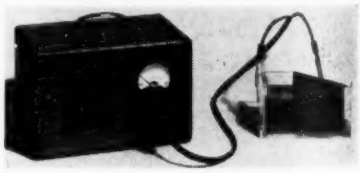
Featuring extra heavy duty bearings, brake and spindle lock on one control and streamlined design, the polishing lathes manufactured by the Square Deal Machine Co., Dept. MF, 3695 Ot's Street, South Gate, Calif., has been installed in many of the west coast polishing and plating shops.

The Square Deal Machine Company, organized at the close of the war, went immediately into production on their machines which range from one to 15 horsepower in single or split shafts. It is said that particular attention has been given to incorporating the utmost in rigidity and long-wearing qualities accomplished through such features as all-welded construction, totally enclosed motor and controls for easy cleaning, precision ground shaft, and double roll ball bearings with positive dirt and dust seal; from the first the emphasis has been on quality material and workmanship.

Plastic Test Cell

The new, clear, plastic Hull Cell test unit, manufactured by R. O. Hull & Co., Inc., enables the plating operator to observe test plating characteristics of brass, cadmium, chromium, copper, nickel, silver, tin and zinc

The test is made by a miniature plating unit designed to produce a cathode deposit that records the character of electroplate produced at all current densities within the operating range. The character of the deposit so produced is dependent upon the



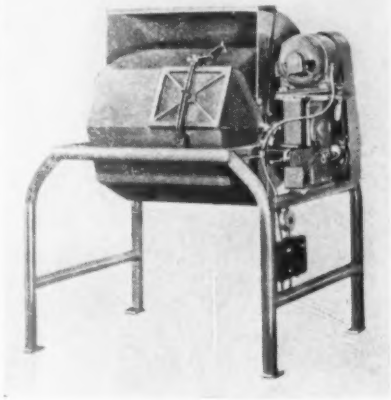
condition of the plating bath with respect to the primary components, addition agents, and impurities. According to the manufacturer, the cell enables the experienced operator to determine the following facts regarding plating baths: approximate limits of bright current density range; approximate concentrations of the primary constituents, such as cadmium content, sodium cyanide content, nickel metal content, etc.; addition agent concentrations; metallic impurities. The unit is also claimed to

be an indispensable instrument for experimental plating investigations, such as for addition agents, "covering power" or lowest current density at which a deposit is produced, average cathode efficiency, average metal distribution or throwing power, and effects of pH, temperature, and decomposition products.

Complete information may be obtained by writing, on business letterhead, direct to R. O. Hull & Co., Inc., Dept. MF, 1279 West Third St., Cleveland 13, Ohio.

Tumbling Barrels

Almco, Inc., announces a line of 11 octagonal deburring and finishing barrels of 30" diameter and 32" to



60" length, with 9 standard compartment sizes from 12" to 60" length. Design features include 4-speed drive, quick-clamp doors and welded steel construction throughout.

These barrels are furnished either plain (unlined) or with full neoprene lining. They are motor-driven at 10, 15, 20 or 30 r.p.m. (approx.) through a speed reducer and 4-step V-belt pulleys, a lever-operated belt release mechanism permitting selection of the desired speed. To facilitate positioning of the barrel for loading and unloading, rotation in both directions is controlled by a start-stop lever which applies a hydraulic brake when in the "stop" position.

The compartment doors are light in weight (21¼ lbs. each for 16" compartment), and are opened and closed by a toggle clamp. The clamping lever permits the door to be cracked open for draining before unloading. All doors have a watertight sponge rubber seal, with a take-up adjustment to compensate for eventual compression of the seal. For rapid and complete unloading, door

openings come within 3/4" of the compartment end walls.

All Almco barrels are mounted in a welded tubular steel frame as illustrated, giving free access to the doors for loading. To permit unloading directly into a work pan or onto a screen, there is 28" clearance beneath the barrel. The barrel itself has an approved guard rail and pull-down safety hood, and the driving mechanism is fully enclosed to meet all safety requirements.

A descriptive bulletin is available on request from Almco., Inc., Dept. MF, 231 E. Clark St., Albert Lea, Minn.

Light-Duty Polishing and Buffing Lathe

A new addition to their line of polishing and buffing lathes was recently announced by Hammond of Kalamazoo.

The unit is designated "Model ROL" and is made with 8" overhanging spindle and straight front-type ball bearings. It is designed for finishing small parts, color buffing, brushing and light-cut buffing and polishing operations. The lathe is furnished with 2 or 3 HP motors and with any one spindle speed from 1200 to 3600 RPM. Multi-V-belt driven, the spindle speed can be changed by replacing the motor sheave only. The motor is mounted on a hinged motor plate for adjustment of belt tension.

For further information write Hammond Machinery Builders, Inc., Dept. MF, 1600 Douglas Ave., Kalamazoo 54, Mich.

Palm Protector

Many line production jobs that require only light protection on palm.

first finger and palm side of little finger, are said to be speeded up safely with a new handguard made by Industrial Gloves Co.

As illustrated, the guard leaves thumb and finger tips free for picking up material and provides complete flexibility due to open-back construction. The guard is made of split cowhide and is steel stitched throughout. The elastic web band on the back is stated to give a snug, comfortable fit and easy to take on or off.

Sizes for men and women may be had in pairs or for right or left hand as required on any certain operation.

Samples are available by writing Industrial Gloves Co., Dept. MF, Danville, Ill.

Filter-Type Dust Mask

The new Fulface Dust Mask combines complete facial and respiratory protection against dusts without obstructing vision, it is said. Comfort and safety where nuisance or harmful dusts affect the eyes as well as the respiratory system are assured by the gas-tight seal of the mask and its replaceable filters, according to the maker.

Lightweight and flexible, yet durably constructed, the unit is said to cover the entire face, conforming snugly to facial contours. Headbands

are designed to be easily and quickly adjustable.

It is claimed that the twin large-area throw-away filters remove dusts efficiently yet offer very low breathing resistance. Inexpensive and easily replaceable, it is said the filters are encased in durable, lightweight aluminum containers which are placed low at the sides of the mask to permit unobstructed vision. A rubber exhalation valve provides breathing ease and quick drainage of moisture.

A large single clear plastic lens permits wide-angle vision to the wearer, while rubber air deflectors direct incoming air over the inside surface of the lens, preventing fogging.

For Bulletin No. CR-19 on the new mask, write direct to Mine Safety Appliances Co., Braddock, Thomas, and Meade Streets, Pittsburgh 8, Pa.

Rhenium Plating

A new development in the electrodeposition of metals, the plating of rhenium metal directly upon any base metal, was recently announced by Cro-Micron Process & Research Corp.

The rhenium is said to be plated under similar conditions and with the same equipment as any standard electrodeposition technique. Rhenium,

element number 75, has qualities which make it excellent for acid-resistant applications, such as dies, machine parts, apparatus, etc. It will resist any dilution of either hydrochloric or hydrofluoric acids. It has a melting point of 3167 degrees C. and will not react with nitrogen at 1000 degrees C.

For further information write the Cro-Micron Process & Research Corp., Dept. MF, 180 Mulberry St., Newark 2, N. J.

Antique Treatment

The Hanson-Van Winkle-Munning Co. announces a new material for producing a rich oxidized or "antiqued" effect on sterling and silver-plated products.

No electric current is required. The work is immersed in Platin-Nig solution, prepared according to simple directions and the parts are then highlighted for striking light-and-shadow relief.

The treatment is said to heighten the "quality look" of silver products. Full details are available by writing Hanson-Van Winkle-Munning Co., Dept. MF, Matawan, N. J.

Goggle Service Station

A new safety goggle cleaning station which can be attached to the wall

at strategic locations throughout plants is announced by American Optical Co., Dept. MF, Southbridge, Mass. As a constant reminder for workers to keep their goggles clean, the new lens cleaning cabinet reduces the possibility of accidents or spoiled work caused by blurred vision.

Made from selected hardwood in

safety green color with smoothly lacquered finish, the cleaning station is designed in a small compact unit with provisions for all necessary cleansing and anti-fog materials. It is 13" long, 9" high and 6" deep.

Directions for using the goggle cleaning station are printed on the front panel of the cabinet. Supplies of the necessary lens cleaning fluid, cleansing tissues and anti-fog compound for reducing fogging, steaming and frosting of lens surfaces are also obtainable from the optical company.

Screw-Drum Washer and Dryer

A new screw-drum type machine which has just been announced by Optimus Equipment Co., Dept. MF, 127 Church St., Matawan, N. J., manufacturers of metal washing machines and dryers, can be used for washing and drying metal parts, rinsing and drying them, or any part of these operations.

The new machine can also be adapted for a wash-drain, rinse-drain, cold or hot air dry sequence, or for pickling operations. It is particularly designed to handle difficult rinsing and drying jobs involving screw machine or small stamped parts.

The dryer end is completely closed to avoid air loss. The air stream passes through a heater and blower which provides for either hot or cold air blast system.

All parts of the machine are said to be readily accessible for lubrication, maintenance or alterations. Centralized lubrication may be provided.

Plating Tank Grids

Rubber linings of plating and pickling tanks can be protected with new seamless rubber covered mesh grids offered by Automotive Rubber Co., Inc., Dept. MF., 8611 Epworth Blvd., Detroit 4, Mich.

Tank linings and agitation coils are claimed to be protected by these rubber insulated grids against damage by heavy or sharp parts which may be dropped in the tank or by contacts from baskets and handling equipment. The frequency of relining tanks and the expense and inconvenience involved in work stoppage when such repairs must be undertaken are thus said to be reduced. The seamless rubber coating prevents contamination of the plating solution which results from corrosion of exposed metal equipment.

The new grids are constructed of expanded metal reinforced with angle iron and supported on heavy channel iron. Lifting eyes are provided for removal to clean tank and for retrieving fallen parts.

The firm has been one of the pioneers in the development of rubber coated plating equipment including tanks, plating racks, anode, dipping and handling baskets, drums and pails. Production parts and ventilating equipment are also processed.

Plating Rack Coating

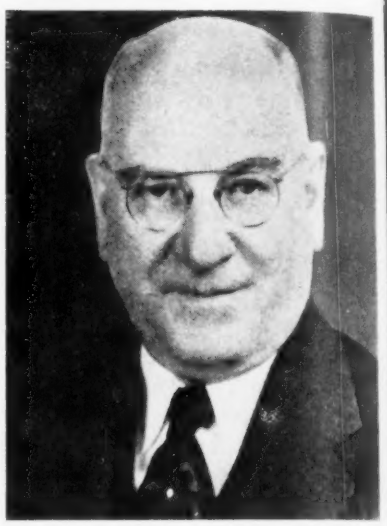
A new coating for the insulation of plating racks, designated as "Polasol E" has recently been developed. The material is a high viscosity, 100% solids coating and is claimed to have superior electrical insulation characteristics, excellent chemical resistance and mechanical strength.

The insulation is applied to a wire-brushed rack to remove loose particles before coating, dipped or brushed and baked, all in one cycle, thus eliminating multiple coating costs. The rack is baked at 338-356 degrees F. for 10-15 minutes; it is stated skilled operators are not required to perform the entire operation. For fractures or other imperfections in the coating during application, repairs may be made by applying a small portion to the affected area and curing with a small infra-red lamp.

For further information write Polamold Products, Dept. MF, 240 Ludlow Ave., Springfield, Ohio.

Business Items

Royer Heads U. S. Chemical Stoneware Sales



Hubert Royer

The appointment of *Hubert Royer* as sales manager of the *Chemical Stoneware Division* of the *U. S. Stoneware Co.* is announced by *Howard Farkas*, vice-president and general sales manager of the firm and its various divisions.

Mr. Royer comes to U. S. Stoneware from *General Ceramics and Steatite Corp.* In his 27 years as a sales engineer for General Ceramics, he has built an industry-wide reputation both as a chemical and ceramic engineer. His broad experience in the application of chemical stoneware to the process industries makes him excellently fitted to direct the sales of this important division of U. S. Stoneware.

Mr. Royer will be located in the New York office, 60 East 42nd St.

Howard Goodman Joins General Abrasive

Howard Goodman, for the last several years vice-president of the *Varcum Chemical Corp.*, has joined the *General Abrasive Co., Inc.*, and will have charge of sales. He began his work on March 1st, 1947. Mr. Goodman succeeds *A. J. Sandorff*, who resigned to join *A. P. de Sanno and Sons, Inc.*

Robert A. Macfarlan Dies

Robert A. Macfarlan, 54, manager of the *Du Pont Company's* finishes plant in Parlin, N. J., died on February 12 in Middlesex County Hospital, New Brunswick, N. J., after an illness of several months. He is survived by his wife and three sons. His brother, *E. J. Macfarlan* of the Fabrics and Finishes Department of the Du Pont Company at Wilmington, Del., also survives.

Osborn Appoints New Factory Representative

Appointment of *L. F. Holfelder* as factory representative for the *Brush Division* of the *Osborn Manufacturing Co.* of Cleveland, to serve the Cincinnati, Louisville and Nashville, areas, was announced by *Robert Wier, Jr.*, general sales manager of that division of the company's operations.

L. F. Holfelder

Mr. Holfelder, who recently was discharged from the United States Army which he served as first lieutenant in the European Theater in England, France, Belgium and Germany, will make his headquarters in Silverton, a suburb of Cincinnati. Prior to his service in the Army, Mr. Holfelder was connected with the *Central National Bank* of Cleveland. He is a native Clevelander.

The area now being served by the new factory representative represents a consolidation of portions of two larger territories which have grown in industrial importance in recent years. The new setup will allow more concentrated sales and service facilities, in line with Osborn's postwar policy, Mr. Wier said.

Circo Products Company Moves to New Plant

Circo parts cleaning units and *Dee Tee Cleaners* are now being produced in the new, completely modern factory building just completed at 12117 Berea Rd. in Cleveland, Ohio.

Located on a two-acre factory site which will permit further contemplated expansion, the new plant will employ about 250 additional people and provide a substantial increase in the production of equipment.

Headed by its young, aggressive president, *John Black*, who has been with the company since 1929, the *Circo Products Co.* has introduced many new parts cleaning units to the automotive

trade and is today recognized as a leading authority in both the development and manufacture of cleaning equipment.

With the greatly increased production facilities now available, their sales organization has also been enlarged to provide trained engineering assistance to the hundreds of jobbers in all sections of the country.

Wyandotte Appoints Weller to Head Market Research

Paul L. Weller, effective March 1, has become assistant director of the Market Research Department of *Wyandotte Chemicals Corp. Melvin E. Clark*, formerly in charge, will become a manager in the sales department of the *Michigan Alkali Division.*

Mr. Weller has been an analyst in the Market Research Department since 1945. Before joining Wyandotte he did engineering work for *Goodyear Tire and Rubber Co.* During the war he assisted in perfecting the engine mounts for the B-29 and the B-17. He has completed graduate work at Ohio State University and has compiled market research figures for other national organizations.

Paul L. Weller

During the past year, Mr. Weller has been active in making field surveys of the industries served by the *J. B. Ford Division* of Wyandotte Chemicals. He will continue his activities along this line in addition to assuming further responsibilities in enlarging the scope of the Market Research Department.

Mutual Chemical Appoints T. F. Moore

Thomas F. Moore has recently been appointed sales manager of the Mutual Chemical Company of America, according to a notice issued by its President, *George A. Benington.* Moore has been with Mutual since July 1943, and prior thereto was for seven years with General Chemical Company, first in New York, Cleveland and then as Manager of their Detroit Sales Office.

Thomas F. Moore

United Chromium, Ltd., Formed in Canada

United Chromium, Ltd., a subsidiary of *United Chromium, Inc.*, has been formed to meet the increasing demand in Canada for *Unichrome* processes and materials. This new company will handle all of United Chromium's organic coatings for product finishing and industrial maintenance as well as their electroplating processes and materials. Offices are located at 15 Emily St., Toronto, Canada, where *Mr. James Guffie* will be in charge as manager.

Mr. Guffie, who has been with United Chromium for 18 years, is well known

A modern INDUSTRIAL FILTER will help YOU!

- Cut your plating costs
- Speed up production
- Produce quality plating
- Eliminate numerous plating troubles

Only CLEAN plating solutions can produce clean, non-porous plated coatings. The low cost for clarifying plating solutions with INDUSTRIAL FILTERS is really a saving as rejects are reduced and quality is greatly improved. Continuous clarification (filtering) also creates a beneficial circulation.

Illustration of a typical large capacity complete stationary filte system designed to provide adequate filtration on large automati plating machines. Arrangement consists of filter, pumping unit primer-strainer unit, mixing tank, control valves, fittings and pip ing. These features facilitate the convenient use of filter aids an purifying agents, making it an ideal continuous filtration systen equally effective for intermittent filtering. Systems are provided fo either acid or alkaline solutions.

FOR TWENTY YEARS "INDUSTRIAL" HAS BEEN BUILDING PLATING SOLUTION FILTERS THAT HAVE ENJOYED AN OUTSTANDING REPUTATION FOR: RUGGEDNESS, DEPENDABILITY, LOW UPKEEP COST, LONG LIFE AND BED ROCK OPERATING ECONOMY. THAT'S WHY SO MANY PLATERS SAY: I PREFER THE "INDUSTRIAL" WAY.

INDUSTRIAL
FILTER & PUMP MFG CO.

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tenance and repair officer in the 8th Air Force in the European Theater and later was assigned to an American Army team to investigate Axis aircraft developments in Germany. Before his release from service, he spent a year working on development of new jet aircraft in the Engineering Division of the Air Material Command, Wright Field, Dayton, Ohio.

Two Newcomers on Udylite Sales Staff

James E. Fitzgerald and *Harvey E. Zens, Jr.*, have just joined *Udylite's* sales organization and are assigned to the Detroit office.

Fitzgerald, a native Detroiter, who served during the war in the Coast Guard, formerly attended Notre Dame and both Libbey-Owens and the Ford Trade Schools. He has been associated with *Plymouth Motor Car Co.*, *Nicolay Dancey* and *Howe Mart: Glass Co.*

James E. Fitzgerald

James Guffie

in Canada. For the past 8 years, he has worked in close cooperation with Canadian industry as a service engineer for the firm. In addition to his new managerial duties, Mr. Guffie will continue to render technical assistance to licensees of the company.

John H. Schneider Joins Pennsalt Sales Force

John H. Schneider, former major in the United States Army Air Force, has joined the Sales Service Staff of the *Special Chemicals Division* of the *Pennsylvania Salt Mfg. Co.*, *William P. Drake*, manager of sales, announced.

Mr. Schneider, a graduate of the University of Minnesota in Aeronautical Engineering, served as a main-

Harvey E. Zens, Jr.

Zeus, also a native Detroiter, who served as a Captain in the Army Air Corps during the war, formerly attended Albion College and Wayne University. He has been associated with *Dodge Motor Co., Carboloy Co.* and *Meier Brass and Copper Co.*

Electric Products Appoints Doss to Cleveland

To better serve their customers, *The Electric Products Co.* announces the establishment of a Cleveland District Office with headquarters at the factory at 1725 Clarkstone Rd., Cleveland 12 Ohio. This district is to be headed by *G. J. Doss.*

The new District Office will handle all sales and service negotiations in the territory, which consists of Western New York and Pennsylvania, Ohio, West Virginia, Kentucky and Tennessee.

G. J. Doss

Mr. Doss brings to his new position a broad experience in electrical sales and engineering, most of which has been in this same trading area.

Westbrook Joins Staff of Case School

Leon R. Westbrook, formerly research manager of the Electroplating Division of *DuPont* has been appointed to the staff of *Case School of Applied Science*, Department of Chemistry and Chemical Engineering, in Cleveland, Ohio, where he will devote his time to teaching, research and consulting work in electroplating and allied fields.

McCracken Made Director of Research at Detrex

Doctor W. L. McCracken has been

appointed director of research and manager of alkali manufacturing by *Detrex Corporation*, Detroit, Michigan, according to an announcement by *A. O. Thalacker*, vice-president and general manager.

This promotion gives Dr. McCracken complete charge of chemical research and development engineering, as well as the chemical manufacturing operations carried on at the Detrex Hillview Plant. This covers activities in both industrial metal cleaning and drycleaning divisions of the company.

Dr. W. L. McCracken

Dr. McCracken will serve under *C. F. Dinley, Sr.*, vice-president in charge of research and engineering.

Prior to the war, Dr. McCracken had charge of research and development for the third Detrex division, oil-extraction. He holds three degrees, B.S. (School of Mines and Metallurgy, University of Missouri) M.S. and Ph.D. (Iowa State). He is a member of the American Chemical Society and the Society of Oil Chemists.

Maire Appointed Regional Sales Manager

General Controls Co. announces the appointment of *E. B. Maire* as regional sales manager of their mid-Western, Southern and Eastern Branch Office territories: Boston, New York, Philadelphia, Pittsburgh, Detroit, Cleveland, Atlanta and Chicago.

As regional sales manager, Mr. Maire will assist and coordinate the efforts of the above factory branch offices with the factory relative to the company's line of automatic pressure, temperature and flow controls.

Gammel Assumes New Post at Osborn

Effective February 1, 1947, *James G. Gammel* became sales promotion and advertising manager of the Brush Division of *The Osborn Manufacturing Co.* of Cleveland, to succeed *G. O. Rowland*, who has resigned that position, it was announced today by *Robert Wier, Jr.*, general sales manager of the company's Brush division. Osborn is the world's largest producer of power brushes for industry and is

James G. Gammel

a leading manufacturer of foundry equipment.

Mr. Rowland, who is well known in advertising circles, has been with Osborn for twelve years. He resigned to assume direction of the *Northern Indiana Supply Co.* in Kokomo, Ind., in which firm he has recently acquired an interest. He plans to move his family to Kokomo immediately.

Mr. Gammel came with Osborn as a member of the sales promotion and advertising departments in 1939. Shortly thereafter he joined the field force representing the company in the southern New England states. He was absent on leave in the Armed Services as a Lieutenant in the U. S. Navy for three years, returning to Osborn last August. He is a native Clevelander and a graduate of Yale University and has been active here as a member of the Yale Alumni Association.

Udylite Appointed Distributor for Electric Products Co.

Announcement is made of the appointment of the *Udylite Corp* as national distributor of the electrolytic

motor-generators and control line manufactured by *The Electric Products Co.*, Cleveland, Ohio.

It is felt that the national facilities of the new distributor will facilitate service and sales.

Optimus Appoints Clarence M. Smith

Clarence M. Smith, of Lancaster, Pa., has been appointed field service representative for Central Pennsylvania by *Optimus Detergents Co.*, 126 Church St., Matawan, N. J., manufacturers of industrial cleaning materials.

Mr. Smith has had a wide experience in the industrial cleaning field. A graduate of the Philadelphia College of Pharmacy, he joined the *Philadelphia Chemical Supply Co.* of Harrisburg, as a salesman in 1930. In 1941, he became sales representative for Central Pennsylvania for *Magnuson Products Corp.* of Brooklyn. From 1942 to 1946, Mr. Smith represented *Magnus Chemical Co.* in their Baltimore territory.

The appointment of Mr. Smith is part of an expanding sales and service program now being undertaken by Optimus.

Wyandotte Chemicals regional supervisors were guests at a recent staff meeting of the Research Department of their company.

Standing—left to right are: Gordon Wood, Midwestern; P. S. Spencer, Sales Manager Pacific Division; G. T. Robinson, Northwestern; Gail Eldridge, North Central; Tom Jones, Southern; and C. W. Troxell, Central. Absent when photo was taken were: A. J. Bettelheim, Eastern and H. E. Ellison, Eastern Canadian.

Carter B. Robinson, vice president in charge of sales, J. B. Ford Division is seated at the extreme right. Dr. Thomas H. Vaughn, director of research is seated at the extreme left.

Buckingham Products Changes Address

The Buckinghom Products Co., manufacturers of a complete line of buffing compounds and compositions, announce that their address has been changed to 14100 Fullerton Ave., Detroit 27, Mich. The firm was formerly located at 8900 Hubbell Ave., Detroit 27, Mich.

Evans Retires from Mathieson Alkali

George S. Evans, of *The Mathieson Alkali Works*, has retired from his po-

George S. Evans

sition at metallurgist in charge of fused alkali products for the metals trade but will be affiliated with the company as consultant, it has been announced by *D. W. Drummond*, vice-president-general manager of sales. *R. C. Strong*, who was made manager of the Fused Alkali Division on January 1, will supervise *Purite* sales in the future.

A graduate of Virginia Polytechnic Institute, Mr. Evans joined Mathieson as a metallurgist in 1925, after some fifteen years of experience as a chemist and metallurgist. He has been granted many patents covering railway equipment, metal testing apparatus, cupola furnace equipment and processes, and both product and process patents pertaining to the use of alkalis in metallurgical operations.

Mr. Evans is also the author of many technical papers and articles and is a member of the American Foundryman's Association and The Institute of Mining and Metallurgical Engineers.

News from California

By Fred A. Herr

Marbro Lamp & Shade Mfg. Co., 1625 South Los Angeles St., Los Angeles, has under way a $26,000 expansion program which calls for replacing its existing plating and polishing department with an entirely new plating shop equipped to do standard finishes for lamp work in copper, brass, gold and silver. The firm is spending approximately $20,000 for reconstruction of the old shop building, including remodeling of the facade. The $6,000 worth of equipment on which installation began in February includes four solution tanks and a 1500 ampere *Hanson-Van Winkle-Munning* generator. The new shop was designed by *Charles A. Russill*, Los Angeles plating shop consultant and designer, with equipment furnished by the *Sundmark Supply Co.* of Los Angeles.

Charles C. Wirth and *Robert Hand* are now established in a new shop operated under the name of *Bay City Plating Co.* at 1914 Harbor Boulevard, Costa Mesa, Calif.

Wirth was formerly employed in the plating department of the *Menasco Mfg. Co.*, Burbank, Calif.; and Hand operated a job shop in Glendale, Calif., for some time after coming to Southern California from the *Globe Mfg. Co.*, Milwaukee, Wis.

In their new plant in Costa Mesa they specialize in gold, silver, precious metal and non-conductive ceramic plating. The shop is housed in a new 30x40 foot building costing, with equipment, approximately $12,000. Initial tank facilities consist of three silver, two copper, one nickel and one brass tank.

Roger Sundmark and *Charles Russill* of Los Angeles have completed design and installation of a precious metal plating setup for the *Saval Company*, Vernon, Calif., jewelry manufacturers. The new silver and gold plating department is housed in a $3,000 addition to the firm's main plant at 1915 East 57th Street and is equipped with $10,000 worth of equipment. This includes eight tanks—two silver (with 4 barrels), two gold (including 1 still and 1 barrel), one copper, one nickel and brass, and the necessary rectifiers and auxiliary equipment.

Nick Pelliciotti has moved his *Culver City Plating Co.* from 3516 Helms Avenue, Culver City, Calif., to 515 Hewitt Street, Los Angeles, where he will continue to provide job shop service in copper, chrome, nickel and general polishing.

Harry Meagher now operates the only plating and polishing plant in Downey, Calif. It is a modern plant at 1030 Old River School Road equipped with copper, nickel, chrome, cadmium and die-cast nickel facilities. Meagher, a freshman member of Los Angeles Branch, A. E. S., reports that the bulk of his activity at present deals with die-cast job work, plumbing fixtures and novelties.

Spence Electro-Plating Co. has revealed plans for construction of a reinforced concrete factory building at 530 East 15th Street, Los Angeles, as

a 45x116 foot addition to its existing plating plant at 528 East 15th Street.

American Potash & Chemical Corp. has announced plans for erection of a 2-story and basement office building costing $220,000 at West Sixth and Westmoreland Avenues, Los Angeles.

India Paint & Lacquer Co. of Los Angeles has construction under way on a new $11,000 factory building at 2601 Imperial Avenue, Lynwood, Calif.

James Poulson of Milwaukee, Wisc., on January 2 joined the Pacific Division of *Wyandotte Chemicals Corp.*, as service engineer, with headquarters in Los Angeles. He served for 9 years as service engineer in the Milwaukee branch of the company and prior to that in a similar capacity for Wyandotte in Detroit. A member of Milwaukee Branch of the A. E. S., Poulson plans to transfer to Los Angeles Branch.

Louis Reed, formerly affiliated with the *Sanitary Dash Corp.*, New York, and an active member of New York Branch, A. E. S., is now employed in the plating department of the Naval Shipyards at San Pedro, Calif.

Prof. Albert Noyes, Jr., chairman of the chemistry department of the University of Rochester, Rochester, N. Y., and president of the *American Chemical Society*, addressed the Southern California Section of the ACS on January 31 on the subject of "Organic Photochemistry."

The Western Division of the *American Council of Commercial Laboratories* was organized at a meeting in

San Francisco on January 18 at which members of ACCL from the 11 western states were in attendance.

The following officers were elected: president, *Roger W. Tuesdail*, Tuesdail Laboratories, Inc.; vice-president, *Herbert D. Imrie*, president of Abbott A. Hanks, Inc., San Francisco; secretary-treasurer, *E. Ord Slater*, president of Smith-Emery Co., Los Angeles. It was reported that since its inception in 1937, the Council has expanded until it now represents 32 independent scientific laboratories with personnel in excess of 1500.

Manufacturers' Literature

Bright Nickel Process

Sixteen well illustrated pages of a new booklet recently issued cover the subject of products, formulas, economies and services of the *Harshaw Modified XXX Bright Nickel Process.*

The pioneering efforts of the firm in developing bright nickel plating is described and reasons for operating simplicity of the new bath given. Savings claimed for the process are listed as are a partial list of typical bright nickel applications.

The solution is composed of the regular Watt's type nickel bath plus several addition agents to permit operation at high current densities. A free analytical service is offered in conjunction with other service to the bath. Various plants are also shown and plant layouts described.

To obtain a copy of this booklet write *The Harshaw Chemical Co.*, Dept. MF, 1945 E. 97th St., Cleveland 6, Ohio.

Polishing and Buffing Machinery

A completely revised catalogue carrying specifications covering their complete line of polishing and buffing machinery has recently been released by the *Hammond Machinery Builders, Inc.*

This twenty page catalogue is divided into three parts: polishing, buffing equipment; abrasive belt finishing equipment; and automatic and cylindrical finishing machines. Features of construction of the polishing and buffing lathes are explained and the variable speed dial control is illustrated and described. The new *ROL* polishing and buffing lathe is also illustrated and its features listed; the unit is designed for finishing small parts, color buffing, brushing and light-cut buffing and polishing operations. This abrasive belt finishing equipment section lists, with illustrations and specifications, the bench-type backstand idler equipment as well as all the various models, including heavy-duty types. The new aluminum idler pulley which has been added to the backstand line is also shown. Automatic and cylindrical finishing machines are pictured with and without backstand idler equipment.

To obtain a copy, write Hammond Machinery Builders, Inc., Dept. MF, 1600 Douglas Ave., Kalamzoo 54, Mich., and ask for *Catalogue No. 55.*

Dust Collectors

Bulletin No. 101 recently released by *Peters-Dalton, Inc.*, is a sixteen-

page booklet describing the *Hydro-Whirl* principle of wet dust control used in all the dust collector equipment manufactured by the company.

Profusely illustrated, the bulletin gives styles, applications, advantages, sizes and specifications of its dust collection equipment. Fundamentally, the wet collector system is designed to forestall the inconvenience of locating a unit outdoors and is designed to commingle the dust laden air with liquid and by high velocity impingement or centrifugal action, clean the air. Pictures and specifications give data for small, individual applications as well as large battery type units for central systems. Charts and cut-away photographs show the equipment in place and give a clear view of its application.

To obtain a copy of this bulletin write Peters-Dalton, Inc., Dept. MF, 17908 Ryan Road, Detroit 12, Mich.

Vapor Degreasers

A new 8-page booklet illustrating and describing their complete line of degreasers under the *D'Oiler* trade name has recently been published by the *Mechanical Process Co.*

General specifications are listed and important design features given. Illustrations are profuse, showing the built-in exhaust duct that is made with each unit, replaceable cellular condensers which are added for more condensing surface, laboratory and small bench type units, two- and three-dip degreasers, vapor-spray, barrel type, automatic and semi-automatic degreasers of all kinds, as well as special large machines for various applications.

Of especial interest to industrial finishers in this attractive booklet is the descriptive data on vapor degreaser application and construction.

To obtain a copy, write the Mechanical Process Co., Dept. MF, South Orange, N. J.

Finishing Equipment

A new 20-page booklet has just been released on the finishing equipment handled by the *Pariser Electric Motor Co., Inc.*

This profusely illustrated booklet shows the motorized buffers and polishing machines ranging from one to 15 horsepower units in any speed and with any length shaft desired. Sturdy welded construction, ball bearing

throughout, V-belt drive, push-button start, overload protection, motor in stand and no dangerously exposed belting and shafting are some of the advantages claimed for these machines.

The selenium rectifiers handled by the firm comprise units with dial mounted in front of cabinet for uniform adjustment from zero to maximum voltage and amperage. Rectifier sizes range from 25 to 5000 amperes.

Motor-generator sets are also listed. Explained are electric motor driven or gasoline engine driven generators. Available are units up to 100 KW single and three phase 110-220 volts, 2, 3, and 4 wire A.C. and D.C. capacities.

To obtain a copy of this attractive booklet write to Pariser Electric Motor Co., Inc., Dept MF, 165 Centre St., New York 13, N. Y.

Wire Containers and Baskets

A series of bulletins showing their line of industrial baskets for the finishing industry have recently been made available by *The Cambridge Wire Cloth Co.*

Illustrated are crates, baskets, wire cloth and metallic screen for filters, wire conveyor belts and other wire fabrications for use in a variety of applications. Wire crates for high production uses are shown, giving illustrations of special designs in unique applications; baskets for acid dipping, anodizing, cleaning, degreasing, pickling, plating, washing are also described. Special applications of fine wire cloth and screen for plating filtration equipment are pictured and availability in various types of metals given; applications of wire conveyor belts in washing and cleaning techniques is also explained. All types of material are available in a variety of metals.

To obtain a copy of these bulletins write The Cambridge Wire Cloth Co., Dept. MF, Cambridge, Md.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

Boston Branch

To those who have attended meetings in past years, not much urging will be needed to insure their appearance again this year at the twelfth annual meeting of the *Boston Branch* of the *American Electroplaters' Society*.

The Educational Session will start promptly at 2 P. M., at the Hotel Statler, with a question box period conducted by *Dr. George P. Swift*. Questions may be submitted at any time prior to March 15 to *Mr. Leonard A. Chesworth*, c/o United Carr Fastener Corp., 31 Ames, St., Cambridge, Mass. In the usual manner, ladies will be entertained in the afternoon by a committee selected for this purpose. Speakers will be *Dr. M. M. Beckwith*, Harshaw Chemical Co.; *Mr. W. H. Jackson*, Udylite Corp.; *Mr. W. M. Phillips*, General Motors Corp.

The banquet in the evening, starting at 7:00 P. M., will, as always, top off the day. There is to be dancing to the music of a carefully selected band and a floor show that is said to rank tops in beauty and entertainment; a typical Hotel Statler dinner is to be served.

For hotel reservations write *Mr. Walter L. Larsson*, 1113 Statler Bldg., Boston, Mass.; for ticket reservations contact Dr. George P. Swift, 53 Galen St., Watertown, Mass.

Baltimore-Washington Branch

The annual meeting of the *Baltimore-Washington Branch* of the *American Electroplaters' Society* was held in the auditorium of the Materials Testing Laboratory of the National Bureau of Standards, Washington, D. C., on the evening of February 4, 1947. An excellent buffet supper of sandwiches, salads, desserts, and coffee was served and prepared under the supervision of *Mrs. Wendell P. Barrows*, wife of one of the former presidents of the Branch.

After the making of some introductory remarks by *President Abner Brenner*, *Librarian Nathan E. Promisel* presented the two speakers: *F. L. LaQue*, supervisor of corrosion studies conducted by the International Nickel Co., and *Dr. Walter R. Meyer*, president of Enthone, Inc.

Dr. Meyer delivered an interesting talk on "The Preparation of Metals for Electroplating." In his talk he treated on the advantages and disadvantages of different cleaning materials and different methods of preparing metals for electroplating. He stressed the importance of proper pre-cleaning; and he pointed out how to go about judging the quality of cleaning materials. And to make his talk vivid he illustrated it with about 40 lantern slides of graphic charts and microphotographs.

Mr. LaQue also illustrated his talk with a great many lantern slides and blackboard sketches, it being on "Galvanic Corrosion As Related to Electrodeposited Coatings." In his informative and comprehensive talk he gave a laconic description of galvanic corrosion of all metals.

New York Branch

The *New York Branch* of the *American Electroplaters' Society* announces its annual Educational Session and Banquet to be held Saturday afternoon and evening, April 19, 1947.

The Educational Session will be held at the Salle Moderne of the Hotel Pennsylvania, New York. Speakers will be *Dr. H. Bandes*, Sylvania Electric Products, Inc.; *Mr. W. Prine* of the International Nickel Co.; and *Mr. Harold Narcus*, Electrochemical Industries, Inc.

Reservations for the banquet, which is to held in the Roof Garden of the Hotel Pennsylvania, may be made by contacting *Mr. Milton Nadel*, 41-15 50th Ave., Long Island City 4, N. Y.

New England Regional Meeting

The eighth annual *New England Regional Meeting* of the *American Electroplaters' Society* is to be held in New Haven, Conn., on April 26, 1947.

PLAN

TO ATTEND

THE

A. E. S. CONVENTION

IN DETROIT

JUNE 23-27, 1947

The Educational Session begins at 2 P.M. in the Hotel Taft ballroom and the Women's Program is scheduled for 2:30 P.M., Shubert Theatre, New Haven. The banquet will begin at 7 P.M., after which there will be dancing and entertainment; it will be held in the Hotel Taft ballroom.

Reservations are being accepted by *H. L. Kellner*, Chairman, 16 Cherry Ave., Waterbury 86, Conn.

Buffalo Branch

An invitation is extended by the *Buffalo Branch* of the *American Electroplaters' Society* to attend their annual Educational Session and Dinner Dance, Saturday, March 22, 1947, at the Markeen Hotel, Buffalo, New York. The Educational Session starts at 2:30 P.M., and the dinner at 7:30 P.M.

"Date-Line Tomorrow" and "Finishing of Aluminum," illustrated with movies, will be in charge of *Mr. Ralph E. Pettit* of the *Aluminum Company of America* at the afternoon session.

For reservations write *Mr. Charles W. Logan*, General Chairman, 48 Nassau Ave., Kenmore, N. Y.

Chicago Branch

The regular monthly meeting of the *Chicago Branch* of the *American Electroplaters' Society* was held on January 10th at the Atlantic Hotel. *Mr. William P. Coleman* of the *George A. Stutz Manufacturing Co.* provided a very interesting moving picture of the history of copper from its earliest origin to the present day. The uses of copper were also quite completely illustrated. Any other branch having interest in this picture can obtain it upon application to *Ampco Corp.*, Milwaukee, Wisc.

About 105 were in attendance and showed a great deal of interest in the topic.

In the absence of the librarian, *Mr. Joseph Andrus* of Croname, Inc., conducted the question box.

At the annual Educational Session on January 23, *Mr. Henry Strow* of *MacDermid, Inc.* gave a very interesting talk, the theme of the talk given by Mr. Strow was that the only reason for cleaning work was to produce uniform adherent deposits. The work which is to be done in the cleaning process es-

sentially consists of two operations. First, removing dirt and second, preparing the surface for plating. These operations may be broken down to a number of different operations depending strictly on the equipment available and the exact cycle and method which is to be used. Since the majority of diecastings are buffed, the recommended cleaning procedures nearly always are designed to take care of the removal of buffing dirt. The cycles used in this plating nearly always may be summarized into steps consisting of cleaning, rinsing, acid dipping, rinsing, followed by the plating operation. Variations in the cycle of operations nearly always center around the exact method used in cleaning. This may be done in two or more stages and sometimes in one stage only. The effects of different changes in this part of the cycle are discussed with some idea of the type of material which should be used and their limitations. Types of acid dips were discussed and recommendations were made. Trouble in the plating of diecastings nearly always involves specific problems which are best handled on an individual basis.

Los Angeles Branch

Richard J. Wooley, Los Angeles representative of *United Chromium, Inc.*, presented a talk on "Rack Coatings" at the February 11 meeting of the *Los Angeles Branch, American Electroplaters' Society*, held in the Cabrillo Hotel.

Mr. Wooley confined his presentation principally to fundamental factors of the rack coating problem as they are encountered in the daily activity of a job-shop operator. At the close of his talk he submitted for inspection a number of sample racks treated with plastic tape and other coatings.

He devoted the early part of his discussion to answering the self-posed question "Why use rack coatings?" He cited the various reasons why coating racks is essential to efficient and economic operation of a small job-plating-shop as well as the large plating department of an assembly-line manufacturer.

Mr. Wooley discussed some eight or nine subjects dealing with rack coatings, including the following: what is required of a rack coating; physical properties; rack design factors affecting coating life; assembly of racks; number of coatings; drying of coatings. On types of rack coatings, he described the various properties, advantages and disadvantages of plastic tapes, wax, rubber and synthetic resin coatings and, in respect to the latter category, explained the properties of enveloping or film type, and the adherent type of resin coatings.

He also discussed coating technique, including preliminary preparation, viscosity and uniformity, checking of viscosity and dipping procedure.

Precautions that the shop owner should observe to assure attaining high quality of protection in his rack coating were summarized by Mr. Wooley. "Some platers spend much time and

money designing and building a rack and then spoil the results by failing to pay proper attention to the coating," Mr. Wooley said. "By giving due regard to the importance of the coatings as well as to the design and shape of the rack, they would assure themselves longer life and efficiency—and save money on rack cost."

Branch President D. N. Eldred presided at the business session which was held immediately following the close of the educational program. *Sergeant-at-arms Al Sultzinger* introduced the following guests:

Edward S. Ryan, Chicago Branch; *Louis Reed*, member of New York Branch, now on the plating staff of the Naval Shipyards, San Pedro, Calif.; *E. A. Savery*, Long Beach Plating Co.; *Stewart Potter*, Modern Engineering and Development Co.; *L. G. Shoals*, Latex Seamless Products Co.; and *C. L. Sturdevant*.

Discussion as to whether the forthcoming annual educational session on March 22 should be devoted to one or two business sessions led to a showing of hands which ruled in favor of a morning and afternoon speaker's program. *John Merigold* expressed the views of many when he pointed out that the "shop talk" and discussion which the members can indulge in during the noonday luncheon which has featured previous annual sessions at which a morning and afternoon business meeting was held, has always been one of the popular features of those affairs. The arrangements committee headed by Mr. Eldred promised to take this factor into consideration when final plans for the annual session are drawn.

At the request of the chair, *Mitchell Raskin* of the Ruby Lighting Corp., outlined a new series of classes in metallurgy which the University of California at Los Angeles is sponsoring as part of its extension course, beginning February 24.

Mr. Raskin has been appointed instructor in two classes devoted to the science and practice of electroplating. The first course, he announced, consists of 18 meetings, held each Thursday from 7 to 9:30 p. m. at 1027 Wilshire Boulevard, Los Angeles, beginning February 27. This course, Mr. Raskin reported, consists of a comprehensive survey of the science, technique and practices involved in the various methods employed in electroplating for those engaged in some aspect of the field who wish to broaden their knowledge and experience. The course includes the chemistry of electroplating; plating and cleaning of parts; pickling and stripping methods; racking of parts; types of plating—brass, bronze, cadmium, chromium, etc.; filtering; plating problems and their solution; and health and safety problems.

Course No. 2, second in the electroplating sequence, Mr. Raskin declared, also consists of 18 meetings, this series being held each Monday from 7 to 9:30 p. m. at the same location, beginning February 24. This course consists of a more detailed study of the various types of cleaning and plating equipment, both semi- and fully-automatic, and the ideal plant layout, equipment and procedure essential to efficient flow of work. Visits to outstanding plating plants in the Southern California area will be arranged as part of this course, according to Raskin, who also said that guest lecturers will be provided from time to time to discuss their specialties before the class.

NATIONAL ASSOCIATION OF METAL FINISHERS

E. J. Musick, president of the *National Association of Metal Finishers*, recently appointed the following committees to handle the affairs of the National Association for the present fiscal year:

Finance—R. A. Campisi, chairman, Boston; Henry Bock, Detroit; Walter Plumacher, New York; Paul Miller, Evansville.

Membership—Herold E. Coombes, chairman, Pasadena; Paul Henning, Detroit; Joe L. Baar, Kansas City; F. A. Hudman, Houston.

Publicity—Henry Bock, chairman, Detroit; Marus D. Rynkofs, Los Angeles; W. O. Zinn, Chicago; Paul Henning, Detroit.

Labor—Philip Sievering, Jr., chairman, New York; Robert J. Nicholson, Chicago; Glenn Friedt, Detroit; Harold E. Coombes, Pasadena.

Trade Relations—George Harding, chairman, Detroit; Marus D. Rynkofs, Los Angeles; C. R. Crawford, Chicago; Adolph Bregman, New York.

By-Laws—Colgate Gilbert, chairman, Walpole, N. H.; R. A. Campisi, Boston; Webster B. Knight, Detroit; Carl Frantz, Chicago.

The annual meeting of the Association is being held in Detroit, Michigan, on June 25, 1947, at 6:30 p.m. This will be a dinner meeting and all owners of metal finishing shops throughout the country are invited to attend. Further information relative to the annual meeting can be obtained by writing the Office of the Association, 2236-39 Dime Building, Detroit 26, Mich.

During the past month, *Executive Secretary Raymond M. Shock* attended the annual meeting of the Chicago Electroplaters Institute and at this meeting Mr. Shock was authorized to start preparing a manual to be used by job shops inasmuch as the last manual was published in 1936. Since many new developments have occurred in the metal finishing industry during the past decade, it is essential that a new manual be published to assist the job shops in figuring new jobs for such new processes.

The Plating Institute of Michigan has invited the members of the industry to a luncheon sponsored by it on Tuesday, June 24th at 12:30 p.m. The program is now being arranged by *Mr. Henry Bock*, the chairman of the meeting.

THE ELECTROCHEMICAL SOCIETY

The Electrochemical Society will hold its annual spring meeting at the Brown Hotel, Louisville, Ky., on April 9 to April 12, 1947. The chairman is *F. W. Silva*.

Among the scientific and technical sessions to be held will be one on "Electrochemical Reactions" on Wednesday, April 9th at 8:30 P. M.; "Electron Tubes" on Thursday, April 10th at 9:00 A. M.; "Electric Steel" on Friday, April 11th at 9:00 A. M.; "Corrosion of Metals at Elevated Temperatures" on Saturday, April 12th at 9:00 A. M. Two or three additional sessions are planned, the subjects for which are to be announced later.

The appointment of local committee chairmen for the Congress has been completed; the list is as follows:

Dr. T. E. Field, Corhart Refractories Co., Chairman, Hotel Arrangements Committee.

Dr. R. M. Reed, Girdler Corp., Gas Process Div., Chairman, Plant Inspection Committee.

Dr. M. R. Broadbooks, E. I. duPont

de Nemours Co., Co-Chairman, Luncheon Arrangements Committee.

Dr. R. C. Ernst, Head, Dept. of Chem. Engineering, University of Louisville.

Dr. G. Williams, Dept. Chem. Engineering, University of Louisville.

Mr. W. R. Barnes, Dept. Chem. Engineering, University of Louisville, Co-Chairman, Luncheon Arrangements Committee.

Mr. G. W. Humphrey, B. F. Goodrich Chemical Co., Chairman, House and Finance.

WESTERN METAL CONGRESS AND EXPOSITION

The last previous Metal Congress and Exposition was held in Los Angeles in 1941. This year the Show will be held in the two Oakland Civic Auditoriums in the San Francisco-Oakland-Golden Gate Area and will last six days, beginning March 22nd.

An estimated 40,000 scientists, engineers and executives are expected to attend the 5th Western Metal Congress and Exposition. *W. H. Eisenman,* managing director of the Exposition and executive secretary of the American Society for Metals, stated that the estimate is based upon attendance figures of the last show and the fact that the metal industry has expanded so greatly in the West.

All technical sessions and other educational activities of the co-operating societies will be held in the Oakland Civic Auditoriums, the Auditorium Arena and the Auditorium Exhibit Hall, in the buildings where the Exposition will take place.

Technical programs will begin on Monday, March 24th, and will continue through Thursday, March 27th. Daily meetings will begin at 9 A.M. and during the day until 5 P.M.

Exhibitors at the Western Metal Congress and Exposition who are concerned with the finishing field are as follows:

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Blakeslee & Co., G. S., Chicago.
Bristol Co., Waterbury, Conn.
Brown Instrument Co., Philadelphia.
Carborundum Co., Niagara Falls, N. Y.
Detrex Corp., Detroit.
Foxboro Co., Foxboro, Mass.
General Electric Co., Schenectady, N. Y.
Hammond Machinery Builders, Inc., Kalamazoo, Mich.
Handy & Harman, New York.
Houghton & Co., E. F., Philadelphia.
International Nickel Co., New York.
L'Hommedieu & Sons Co., Chas. F., Chicago.
Mall Tool Co., Chicago.
Metal Finishing Service, Chicago.
Metallizing Co. of America, Chicago.
Norton Co., Worcester, Mass.
Oakite Products, Inc., New York.
Pacific Abrasive Supply Co., San Francisco.
Pangborn Corp., Hagerstown, Md.
Porter-Cable Co., Syracuse, N. Y.
Solventol Chemical Products, Inc., Detroit.
U. S. Hoffman Machinery Corp., New York.
Vacu Blast Co., Burlingame, Calif.

LOS ANGELES EXPLOSION

(*Concluded from page 73*)

through which Magee succeeded in getting the two chemical agents in solution.

The investigators disclosed on February 22 that since last September a 56-gallon crockery container had been used to hold the solution. When this solution became "dirty" several months ago, it was poured down the drain, with no explosive after effects resulting.

The replacement solution had been in use at the plant until February 10, two days before the explosion, when a new steel tank was set up to hold the replacement solution.

Resting on 12-inch-thick glass blocks, the new tank contained 300 gallons of solution which had been mixed February 15 and 16 by Magee and O'Connor, the latter told the investigators. At the time of the blast, the crockery container with 56 gallons of old solution was stored behind the new tank.

O'Connor told investigators he was unaware of the potential explosiveness of the solution and related how several months ago he had tossed a gallon jug of it into the back of his automobile and driven with it to San Francisco where it was examined by a chemist.

Deputy Fire Chief Richardson reported that there was no indication of the use of the perchloric acid process when the O'Connor shop was given its regular inspection two weeks before the explosion. Richardson declared he had since interviewed a number of Los Angeles plating plant operators and had found none that had used or were using perchloric acid.

On February 21 the Los Angeles City Council unanimously adopted a resolution calling for the inspection divisions of municipal departments to immediately make a special investigation of all electroplating plants in the city, as well as all other business establishments in which chemicals or other elements of potential explosive powers are used.

It was also announced at Los Angeles that the National Fire Protection Association and the National Board of Fire Engineers have promised to explore all angles of the Magee perchloric acid process.

Magee is known to have been in the plant at the time of the explosion. No trace of him had been found up to February 22. Also still missing at that time was Alice Shemeta Iba, 21-year-old Japanese-American girl, who was assistant chemist at the plant.

The last of the 15 bodies to be identified was that of Lowell A. Darling, 23, foreman of the O'Connor Company's polishing department.

Estimates of damage caused by the explosion are between $1,500,000 and $2,000,000, with some indication that if more buildings develop weaknesses, condemnation of them may increase the gross total.

Commenting on the properties of perchloric acid, a chemist interviewed by *Metal Finishing's* Los Angeles representative explained that perchloric acid is highly dangerous because of its ability to release large quantities of oxygen very suddenly. Such action, he said, would produce tremendous pressures upon surrounding areas.

Perchlorate, a powdered form, it was pointed out, has been used as an ingredient of jet power and was said to have been used by the Aerojet Corporation, at whose plant an explosion on August 21, 1946, killed eight persons and injured 25.